Chesapeake Biofuel Policies

Balancing Energy, Economy and Environment

A REPORT OF THE
CHESAPEAKE BAY COMMISSION
AND THE COMMONWEALTH OF PENNSYLVANIA

JANUARY 2010

Leaders in the Chesapeake region should adopt a conservative next-generation biofuels production target of 500 million gallons per year, derived from a mix of agricultural and forest feedstocks.

RECOMMENDATION OF THE BIOFUELS ADVISORY PANEL, 2010

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Preface

An emerging biofuels industry has the potential to significantly impact the Chesapeake Bay region. If handled correctly – in a way that promotes the growth of the industry and also protects the Bay's ecosystem – the economic, energy and environmental benefits could be significant.

This report, the third in a series on biofuels published by the Chesapeake Bay Commission, looks deeper into development of the industry within the Bay region and zeroes in on achievable goals and important first-step policies. Throughout, we have focused on accommodating and encouraging this potential new source of income and prosperity for our agricultural and forestry communities, while assuring the protection and restoration of the Bay and its tributaries. During this extended period of study and reporting, we have found nothing to refute our basic assumption that, with the right information and policies, these are compatible goals.

Chesapeake Biofuel Policies: Balancing Energy, Economy and Environment demonstrates how far we have come since we began our biofuels journey three years ago. Our first report, *Biofuels and the Bay: Getting It Right to Benefit Farms, Forests and the Chesapeake (2007)* set out the economic potential and likely water quality effects of biofuel production. The second report, *Next-Generation Biofuels: Taking the Policy Lead for the Nation (2008),* focused on the opportunities for moving beyond corn-based biofuels into next-generation feedstocks, including policy recommendations for the states and the region. We now present the responses and accomplishments of the Bay state Governors and legislatures from the past year, as well as the results of ongoing analysis by our Biofuels Advisory Panel, guiding us toward important near-term opportunities.

The Commission is deeply grateful for the continuing support of the Biofuels Advisory Panel members, the Commonwealth of Pennsylvania, our funders — the Keith Campbell Foundation and Biophilia Foundation — and the assistance provided by the Commission staff and consultants in our on-going work. We have growing confidence that the development of a biofuels industry in this region, as part of a national strategy to reduce our dependence on foreign energy sources and reduce greenhouse gas emissions, can support our long-term effort to return the Bay to health and promote new sources of sustainable livelihoods for many of our residents.

Introduction: Biofuels as Part of Our New Energy Future

The future of alternative energy in the Chesapeake region and nationwide is being driven by a number of forces. Primary among them are the desire for cleaner fuels, more secure sources of energy, and economic recovery and growth. A mix of new technologies and government incentives and policies will determine the precise response to these forces, including the extent to which alternative energy will be supplied by biomass (plant and animal matter) and, more specifically, the extent to which that biomass will be used to supply liquid biofuels for transportation instead of being used to generate electricity.

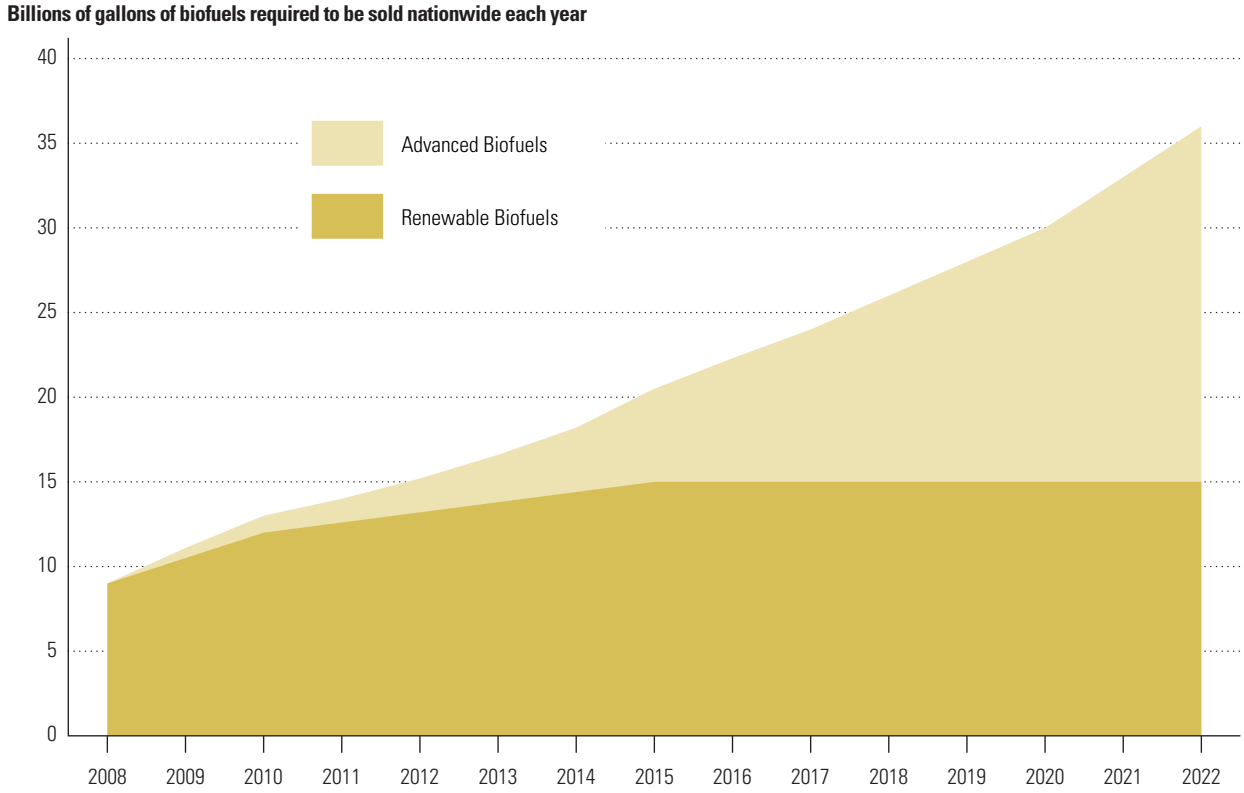
Key among the current incentives are the National Renewable Fuel Standard (RFS), various renewable electricity standards, emerging low-carbon fuel standards and other programs to stimulate and subsidize renewable energy development. The RFS is a clear and powerful force for biofuel production — it will increase the volume of renewable fuel required to be blended into gasoline from 9 billion gallons in 2008 to 36 billion gallons by 2022, approximately 20 percent of our nation's transportation fuel needs. The requirement for ethanol produced from corn is set to level off in 2015 at 15 billion gallons, leaving a national goal of 21 billion gallons of production from advanced biofuels derived from renewable generation feedstocks, such as perennial grasses, woody material, corn stover, algae and municipal waste, by 2022 (see Figure 1).

Although there is still uncertainly as to which conversion technology will become the platform for commercial scale production, most experts agree that perennial grasses, forest residues and short rotation agro-forestry crops such as fast growing varieties of poplars and willow will become the primary cellulosic feedstocks for next-generation biofuel production. The level at which agricultural and forest products from our region will contribute to this target will depend on several factors, including the availability of water, the ease with which feedstocks can be transported, the feasibility of advanced biofuel feedstocks such as algae or municipal solid waste, state and federal environmental laws and competing demand for agricultural and forest biomass for other bioenergy uses.

In the near future, it is likely that biomass will be more widely used for the local generation of heat, electricity and other bio-power options. The level of effort expended on these power generating facilities will depend upon costs, technologies and ease of access to the electric grid for supplementary and excess power. Over time, as the refining and marketing structures for biofuels emerge, the

FIGURE 1

The National Renewable Fuel Standard Will Drive the Biofuels Market



SOURCE: U.S. EPA, Office of Transportation and Air Quality

growing sources of biomass will be increasingly directed to biofuel production. Ultimately, as more bio-refineries are built and their technology expands, they will produce a wide range of final products and services based on the potential of the different feedstocks to be used for energy and other co-products, much as petroleum is used today to produce fuel, plastics, fabrics and other materials (see Figure 2).

The significance for the Chesapeake region is that the pursuit of bioenergy in its various forms will drive a growing demand for agricultural and forest biomass. That production can and should be carried out in a manner that improves water quality and soil conservation, and reduces the flow of nutrients into rivers and the Chesapeake Bay. More than anything else, the studies undertaken by the Chesapeake Bay Commission with the support of the Commonwealth of Pennsylvania and the Biofuels Advisory Panel focus on the often-overlooked environmental effects and potential benefits of biomass feedstock development.

As presented by the Commission in the 2007 report *Biofuels and the Bay: Getting it Right to Benefit Farms, Forests and the Chesapeake*,[1] well-managed biomass production can be a cost-effective way to significantly reduce nutrient and sediment loads to streams, rivers and the Bay — if done right. When blended with current agricultural and forest systems in our region, biomass production can provide more vegetative land cover, reduce erosion and possibly even reduce the adverse impact of manure and commercial fertilizer on water quality by serving as an effective nutrient sink.

As this report notes in greater detail, the Biofuels Advisory Panel conservatively estimates the potential for forest and farm-based biofuels in the region at approximately 500 million gallons per year, using only land resources and practices that improve water quality throughout the region. This estimate assumes no use that limits farmland currently in food or livestock production or forests currently used for wood products. Further analysis by panel members reveals that as many as 18,600 jobs in all sectors of the economy would be created if biofuel refineries are put in place to handle this production level (see Figure 3), bringing an economic boost to communi-

ties throughout the region. It should be noted that this estimate does not consider related job losses, if any, in extractive fossil fuel sectors.

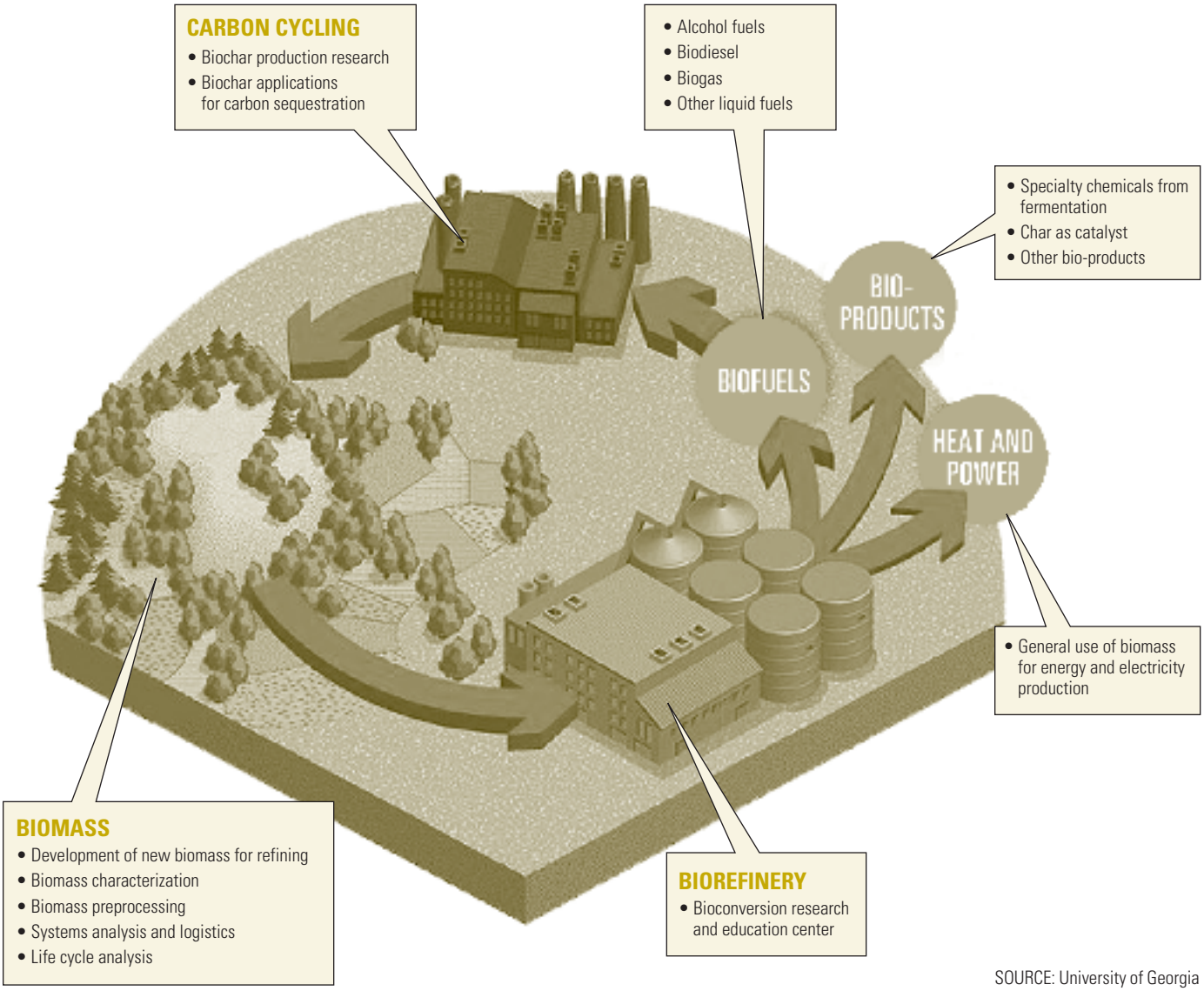
To achieve these economic benefits while protecting our water resources, regional leaders should initiate three key actions:

1. Officially adopt a regional production target and set supporting state-specific production goals.
2. Implement policy on the following near-term opportunities:
   - Develop biomass harvest guidelines.
   - Encourage winter crops as biofuel feedstocks.
   - Avoid introduction of invasive species.
3. Create an interstate, interagency Regional Council for Bioenergy Development that will promote

FIGURE 2

Envisioning the Full Potential of a Biorefinery

Experts believe that future biorefineries will be modeled after the petroleum industry, employing multiple technologies at the same site that produce a wide-range of products and services.



SOURCE: University of Georgia

FIGURE 3

Projected Biofuels Production, Capital Improvement and Employment in Chesapeake Bay Region, 2010–2022

Year	Chesapeake Bay Biofuel Production (Millions of Gallons)	Capital Cost ($/Gallon)	Production Cost ($/Gallon)	Capital Expenditures (Millions)	Production Expenditures (Millions)	Construction Jobs	Production Jobs	Total Jobs
2010	0	$4.21	$1.39	$194.8	$0.0	4,876	0	4,876
2011	42	$4.26	$1.41	$197.4	$82.6	4,941	826	5,767
2012	83	$4.34	$1.44	$200.8	$168.1	5,025	1,680	6,705
2013	125	$4.43	$1.47	$205.0	$257.4	5,130	2,573	7,703
2014	167	$4.52	$1.50	$209.4	$350.5	5,240	3,504	8,744
2015	208	$4.62	$1.53	$214.1	$448.0	5,358	4,479	9,837
2016	250	$4.73	$1.57	$219.0	$549.8	5,480	5,497	10,977
2017	292	$4.83	$1.60	$223.8	$655.7	5,602	6,555	12,157
2018	333	$4.94	$1.64	$228.8	$766.1	5,727	7,659	13,386
2019	375	$5.05	$1.67	$234.0	$881.4	5,857	8,811	14,668
2020	417	$5.16	$1.71	$238.9	$999.8	5,979	9,995	15,975
2021	458	$5.25	$1.74	$243.1	$1,118.9	6,083	11,185	17,269
2022	500	$5.33	$1.76	$246.7	$1,238.9	6,174	12,385	18,559

NOTES: Capital expenditures are based on adding approximately 42 million gallons of capacity annually through 2022. Job creation estimates are based on RIMS II final demand employment multipliers for U.S. construction and other basic organic chemical manufacturing industries. Multipliers are based on 1997 I/O Table and 2006 Regional data.

SOURCE: John M. Urbanchuk, LECG LLC

collaboration among jurisdictions and integrate the issues of biofuels and environmental improvement with other regional priorities such as agricultural and forest sustainability.

This report describes each of these recommendations in detail. When implemented, these actions will help to ensure that our region, its people and the environment can benefit from the growing national momentum toward sustainable domestic sources of energy.

A YEAR OF PROGRESS

The Chesapeake Bay Commission and the Commonwealth of Pennsylvania brought together an unprecedented gathering of regional policy leaders for an in-depth Biofuels Summit, held in Harrisburg, Pennsylvania on September 4, 2008. Legislative, executive, academic and private sector leaders gathered with the singular focus of growing a sustainable biofuels industry that also produces improved water quality and other environmental benefits in the Chesapeake Bay watershed. A response to the Commission's 2007 Biofuels and the Bay report, the Summit featured the release of a second report, *Next-Generation Biofuels: Taking the Policy Lead for the Nation*.[2] This was the result of a year-long collaborative effort by the Biofuels Advisory Panel, a group of experts in the biofuels, environmental, agricultural and forestry fields, convened by the Commission and the Commonwealth.

In the *Next-Generation Biofuels* report, the Advisory Panel identified ten regional and ten state-specific recommendations to achieve both economic growth and environmental stewardship. The report further identified three major areas for action:

- **FEEDSTOCKS:** the assurance of a large, cost-effective and accessible supply of sustainable biomass for advanced biofuels.
- **NATURAL RESOURCE PROTECTION:** implementation of best management practices specific to crops and locations, to reduce adverse impacts on water quality and the environment.
- **MARKETING AND INFRASTRUCTURE:** development of economically competitive feedstocks, transportation, commercial-scale processing and bioenergy production, and marketing of the biofuels and their co-products.

Encouraged by these recommendations and the presentations of national speakers, Summit attendees returned to

their agencies and legislative assemblies with enthusiasm and an urgent sense of action.

At the December 2008 meeting of the Chesapeake Executive Council, the governors of Delaware, Maryland, Pennsylvania, Virginia and West Virginia, the mayor of the District of Columbia and the chair of the Chesapeake Bay Commission signed Directive No. 08-1: Leading the Nation in Development of a Sustainable Next-Generation Biofuels Industry (see Appendix 1).

The Directive calls for the development of state Biofuel Action Plans to address the recommendations in the *Next-Generation Biofuels* report. Each Bay jurisdiction subsequently drafted a detailed plan (or in the case of West Virginia and New York, a statement in lieu of a Plan). Per the Directive, these plans were reviewed by the Biofuels Advisory Panel in advance of the May 2009 Executive Council meeting. In general, the Advisory Panel was pleased with the detail and level of commitment to biofuels, but noted a lack of attention to marketing and infrastructure needs. The Advisory Panel's recommendations to strengthen the plans were shared with Executive Council leadership.

The Pennsylvania, Maryland and Virginia state legislatures considered a number of proposed policy measures in support of the Directive, ranging from increased financial incentives for biofuel production to mandating the sale of larger volumes of cellulosic biofuels. A summary of these actions is included in Appendix 2.

Additionally, the Directive requires the jurisdictions to develop a regional next-generation biofuels production target during 2009 based on environmentally sustainable biofuel feedstock supplies. The Directive also empowers the Advisory Panel to review the status of implementation and provide strategic advice on future actions, including recommendations for the role that the agriculture and forest sectors can play in sequestering and reducing greenhouse gases. The remainder of this report comprises the Advisory Panel's response to the Executive Council's Directive.

Next Steps for the Region

The Chesapeake region is a place where people value their surroundings and the role that a healthy environment plays in their lives. It is a unique part of the American landscape, with vast open lands and forests — some of the richest farmland in the country and the largest stand of mature mixed hardwoods on Earth — all with ready access to markets serving tens of millions of people.

Climate, soils and rainfall are conducive to biomass production and large areas of farmland and forest are underutilized. The landscape would accommodate the type of small-scale bioenergy facilities that can operate efficiently in locations where multiple feedstocks can be utilized according to the season. To optimize use of these resources in a way that supports economic sustainability and environmental protection, and in response to Directive No. 08-1 of the Chesapeake Executive Council, the Biofuels Advisory Panel has identified the following near-term action steps.

SETTING NEXT-GENERATION BIOFUELS PRODUCTION GOALS

The potential economic and environmental benefits of advanced biofuel production are best realized when a sustainable production goal has been clearly defined. To that end, Directive No. 08-1 called upon the Bay jurisdictions to establish a regional next-generation biofuels production goal during 2009.

Combined with the adoption of quantified state-specific production goals, this will build the political and public support necessary to move this nascent industry forward. With the right policies and programs in place we will, in turn, be closer to realizing the related water quality benefits.

In response to the Directive, the Biofuels Advisory Panel has developed a recommended regional production goal as well as a methodology for setting state-specific goals. The Advisory Panel recommends a conservative target of 500 million gallons per year for the region, derived from a mix of agricultural and forest-based feedstocks. This level of production includes implementation of conservation practices to benefit water and soil quality, as well as production of sustainable feedstocks without impacting existing food and livestock production. State-specific goals will vary depending upon each state's feedstock capacity, available infrastructure and market conditions.

The Biofuels Advisory Panel laid the groundwork for its regional goal by narrowing the list of all potential next-generation feedstocks to a few priorities for the region,

favoring those that would provide advantages for energy production, agricultural and forest land sustainability, *and* clean water. These feedstocks include:

- Perennial plants and short rotation woody biomass crops grown on idle agricultural lands (not producing crops at this time) or reclaimed mined lands (see Figure 4)
- Crop residues
- Sustainably harvested wood and forest residues
- Double crops and mixed cropping systems

When combining these feedstocks with a potentially available supply of municipal solid waste (including yard waste, street tree waste and other organic components) for energy production, the Chesapeake region could supply as much as one billion gallons of biofuels every year.

ESTIMATING THE REGIONAL PRODUCTION TARGET

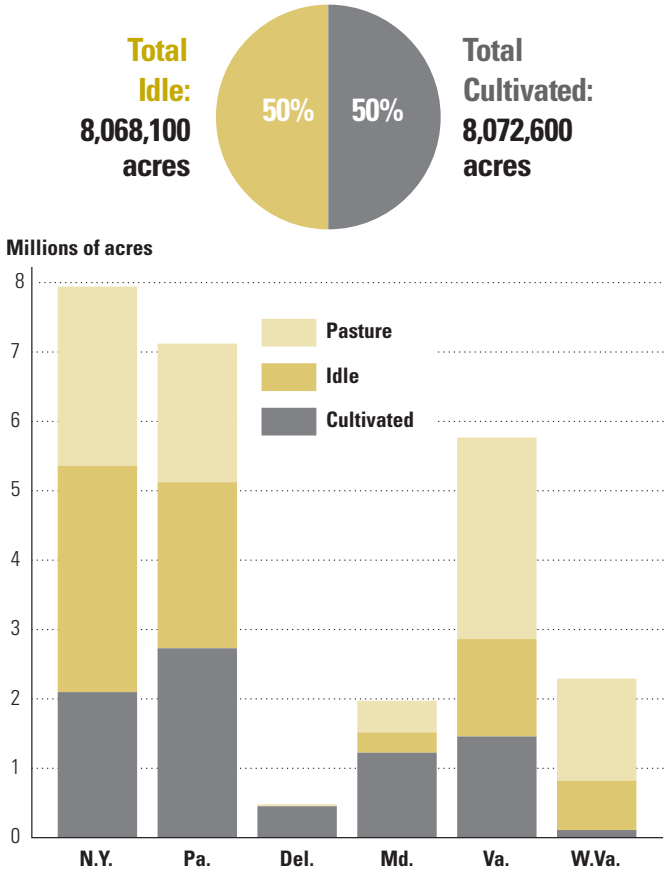
To calculate the regional production target, the Biofuels Advisory Panel established a Regional Biofuels Action Team with Dr. Tom L. Richard of Penn State as chair. (A full list of the team members appears on Page 2.)

At the outset of the analysis, the team agreed to apply the following guiding principles:

1. Production estimates would focus on agricultural and forest-based feedstocks in keeping with the water quality focus of the Chesapeake Bay Commission's overall biofuels initiative. Additional potential feedstocks include municipal solid waste and algae-based biofuels. These were considered but not included in the final analysis because they were determined to be outside the land-based biomass scope of this project and the numbers associated with potential production rates of these sources vary significantly. Nevertheless, the Advisory Panel recognizes that municipal solid waste and algae could be significant future sources of biomass. The potential of algae was described in the *Next-Generation Biofuels* report and municipal solid waste is described on Page 12.
2. The sustainable production of biomass must be market-driven; current subsidies should be seen as short-term incentives that will phase out over time. Production estimates should be conservative to avoid over-promising environmental benefits and market demand, especially as price signals remain unclear.
3. Biomass produced on land currently in food crop production or land being used to feed and raise livestock would not be included in calculating the biofuels production goal. The one exception is where winter biofuels crops are double-cropped.
4. Biofuel feedstocks should be grown with improved agricultural conservation practices and healthier forests in mind, leading to improved water quality for streams, rivers and the Chesapeake.
5. Because questions remain regarding the environmental sustainability and economic feasibility[3] of harvesting corn stover as a source of biomass in our region, it should not be considered as a bioenergy feedstock at this time. As information becomes available, corn stover may be a future feedstock source, but it was not considered for purposes of this analysis.
6. Pasture land is part of the food production system; therefore, potential farmland acreage for biofuel

FIGURE 4

Idle Cropland in the Chesapeake Bay Watershed States



SOURCE: USDA NRCS National Resources Inventory, 2003

crops should be limited to recently abandoned cropland, under-utilized pasture and lands available for grass crops under the Conservation Reserve Program.

7. Based on recent studies, 30 percent of forest slash (branches and leaves left after timber harvest) and related waste should be left on the land to maintain wildlife habitat and soil and water quality.[4]

8. Corn silage acreage should not be included as potential acres for biofuel winter crops. Silage acres are typically associated with dairy farms and any following winter crops would likely also be used for silage feed.

The Action Team used data available from the U.S. Census of Agriculture, the USDA National Resource Inventory, the National Agricultural Statistics Service, the U.S. Forest Service, the U.S. Geological Survey, the Chesapeake Bay Program and other government, academic and private sector sources. The team also relied upon a number of reputable computer models and members' best professional judgment to generate an annual production goal.

The team calculated a production goal based on the following four steps:

1. Determine the total number of acres available for potential biofuels feedstock production consistent with the principles and key decisions described above. Ten different land types and potential feedstocks were categorized by production rates (see Figure 5).

2. Calculate the biomass production potential of those acres, assuring management practices that protect or enhance water quality; this varied from 1 to 8 dry metric tons per acre depending on land and conditions.

3. Estimate the likely participation rate by landowners; this varied from 10 to 60 percent, depending on land type, proximity to transportation systems, and association of that land with current farm operations.

4. Assume conservative average conversion rates of biomass to cellulosic ethanol, determined to be 80 gallons per metric ton of biomass (60 gallons for barley straw).

A number of other decisions by the Action Team deserve mention. Winter rye and barley are the crops used for the winter crop estimates. Based on current practices, experience and climate conditions, rye is more likely to be grown in the northern reaches of the Chesapeake watershed and barley in the south. Therefore, rye calculations are only performed in the three sub-watersheds predominantly in New York and Pennsylvania and barley in the four sub-watersheds predominantly in Virginia and Maryland. Switchgrass is the assumed biofuels feedstock for the other agricultural land classifications. Again, there are other options available,

FIGURE 5

Potential Biomass and Biofuel Production in the Chesapeake Bay Watershed

			Biomass in Metric Tons		Biofuel in Gallons	
Biofuel Crop	Land Type	Acres Available	Low Estimate	High Estimate	Low Estimate	High Estimate
Rye	Corn Grain Cropland	579,225	316,596	474,894	25,327,680	37,991,520
Rye	Soybean Cropland	186,854	115,165	172,748	9,213,200	13,819,840
Barley Grain	Corn & Soy Cropland	1,358,464	868,033	1,302,050	69,442,640	104,164,000
Barley Straw	Corn & Soy Cropland	1,358,464	1,302,053	1,953,080	78,123,180	117,184,800
Switchgrass	Failed Cropland	72,896	55,000	172,500	4,400,000	13,800,000
Switchgrass	Idle/CRP Cropland	447,261	336,000	1,050,000	26,880,000	84,000,000
Switchgrass	Summer Fallow Cropland	39,537	29,000	92,000	2,320,000	7,360,000
Switchgrass	Abandoned Mineland	114,657	13,900	46,400	1,112,000	3,712,000
Switchgrass	Recently Abandoned Cropland	1,680,317	423,000	1,983,000	33,840,000	158,640,000
Slash & Thinnings	All Forests	4.2–11.4m	1,321,800	3,625,400	105,744,000	290,032,000
TOTAL BIOFUEL IN GALLONS:					**356,402,700**	**830,704,160**

SOURCE: Tom L. Richard, Ph.D., Penn State University; Biofuels Advisory Panel's Regional Biofuels Action Team

Municipal Solid Waste as a Biofuel Feedstock

Any discussion of next-generation biofuels must consider the potential role to be played by municipal solid waste (MSW). An estimated 56 percent of these wastes are considered biogenic (containing food and yard waste) and are therefore potential biofuel feedstocks. Given the large urban areas in the Chesapeake region, we produce enormous amounts of MSW and dispose of it through landfill, incineration, recycling and other measures. Beyond this, consider that Pennsylvania and Virginia rank as the top importers of MSW nationwide.

The potential volume of MSW for feedstock is difficult to determine because of inconsistent and poorly aggregated data. Nonetheless, the Biofuels Advisory Panel worked hard to come up with a reliable estimate, determining that 11 million metric tons of biomass per year is potentially available from MSW. This is somewhat greater than the high estimate of 8 million metric tons of biomass feedstock available from farm and forest lands, and nearly double the average of the high and low estimates. Also, the 11 million metric ton estimate only includes the portion of Pennsylvania within the Chesapeake watershed and all of Virginia and Maryland, but none of the New York, West Virginia and Delaware portions of the watershed.

The actual availability of this material in a form usable to a biofuel refinery is hard to determine. Mixed refuse is difficult to separate, and once separated there is competing demand for recycling materials. There are also existing long-term contracts for the reuse of some of these materials. Finally, states and localities are looking increasingly to these wastes as a means of generating electricity.

In conclusion, a lack of available data makes it virtually impossible to estimate with a reasonable level of accuracy the volume of MSW in the region that is likely to be diverted for use as a biofuel feedstock. However, the ubiquity of this material throughout the region means that it cannot be overlooked as a potential feedstock. Its use may help to expand the scale and feasibility of biofuel production facilities that may otherwise have been solely supplied by agricultural and forest material, thus improving the prospects for land-based biomass and associated benefits.

such as Miscanthus (a family of fast-growing tropical grasses) or fast-growing trees, but the team preferred the more conservative and reliable estimates available for switchgrass at the regional scale.

Most of the categories of land use are self-explanatory, but a few require further definition:

- "Recently abandoned cropland" includes all agricultural croplands abandoned since 1969. To account for urban growth, the acreage was reduced by the proportion of total agricultural land that transitioned to urban, based on a comparison of historical land cover data. The landowner participation rate is also on the low end of the scale, so as not to artificially inflate the numbers.
- The acreage needed to sustain current production levels of hardwoods and pulpwood is not included in the acreage calculation for woody biomass production since they are currently of higher value than biofuel feedstock. Additionally, the forest production numbers assume sustainable forests managed for water quality and long-term productivity.
- Rye and barley are presumed to be grown on acres that are currently fallow in the winter. Acres currently in production of a winter crop or a winter cover crop were not included.

Before looking at the details, it is useful to have some overall sense of the size of the Chesapeake Bay watershed, a land area of approximately 41 million acres. Of the 12.8 million acres that are farmland, 3 million acres are woodlands, 7.2 million acres are cropland (of which a little over 6 million acres are harvested) and almost 2 million acres are in permanent pasture. Another 21.6 million acres are in forests outside of farms (see Figure 6).

Figure 5 summarizes the Action Team's estimates for each of the steps described above. The low and high estimates for biomass and biofuels production reflect the range of value associated with land type and landowner participation as explained in Steps 2 and 3. Data sets used to develop Figure 5 can be accessed at *www.chesbay.state.va.us*.

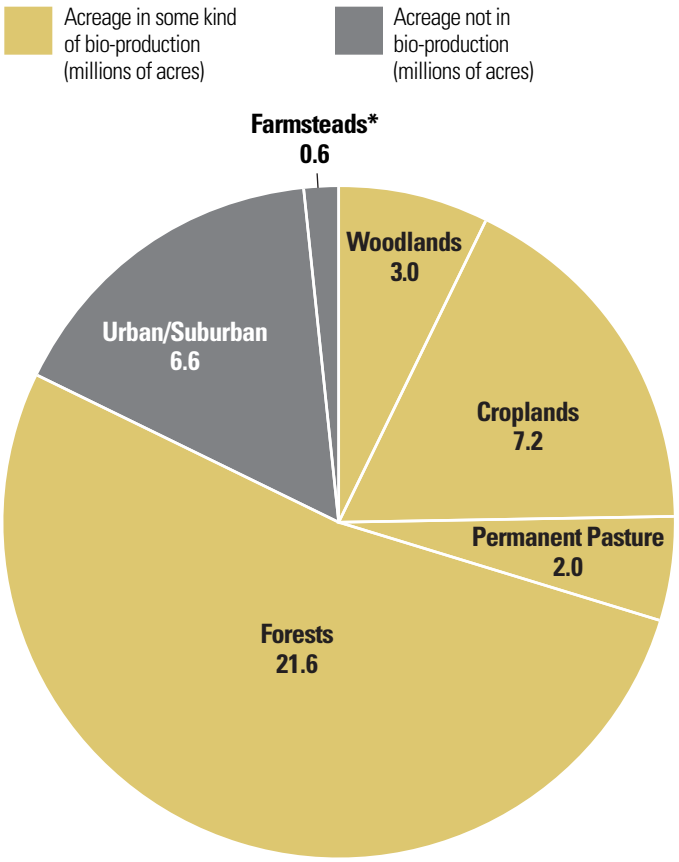
Building on these estimates, it is reasonable to establish a conservative next-generation biofuels target for the region of 500 million gallons per year from agricultural and forest-based feedstocks.

The Advisory Panel fully recognizes that the biomass produced under these scenarios may be used for generated power instead of biofuels. Any such diversion of biomass would ultimately reduce the potential biofuel production rate. However, the Panel chose to remain focused on biofuels, for which there are existing government incentives and regional economic development projections. While biofuels are the nominal target of the report, the environmental and especially water quality benefits of growing appropriate biomass feedstocks would be similar regardless of ultimate energy use.

In addition to justifying an investment in refining capacity and infrastructure, the analysis demonstrates that biofuels could indeed be a substantial additional source of income for farmers and forest landowners and could complement existing food and forest product production. While it would be difficult to prevent some farmers from converting existing crop and grazing acreage to biofuel feedstocks if market conditions encouraged it, there are enough acres of underutilized forests and agricultural land in the region to meet this goal without endangering food and feed supplies. Next-generation biomass production would also result in improved water quality

FIGURE 6

Land Use in the Chesapeake Bay Watershed



*Barns, outbuildings, storage lots, etc.

SOURCE: U.S. EPA Chesapeake Bay Program Office, 2009

from beneficial agricultural management practices such as widespread winter crops, perennial grasses and more actively managed forests.

There is also substantial potential for biofuel feedstock from the biogenic (food and yard waste) portion of municipal solid waste. This could provide the potential for another billion gallons per year, twice the amount of biofuels anticipated from agricultural and forest-based feedstocks in the region.

To put these numbers in perspective, the Renewable Fuel Standard provision of the Federal Energy Independence and Security Act of 2007 requires 36 billion gallons of biofuels to be used in the nation's transportation fuel supply by 2022, of which 21 billion gallons are expected to come from cellulosic and other advanced (non-corn starch) biofuels. With about 2.5 percent of the U.S. land area and 5 percent of the national population in the Chesapeake watershed, our share of the 21 billion gallons of advanced biofuel target would be between 500 million and one billion gallons per year. Adding the potential role of municipal solid waste to the conservative figures developed by the team would allow the region to meet its fair share of the national requirement.

However, unlike the large-scale corn ethanol refineries in the Midwest, refining facilities in the Chesapeake region will be relatively small, locally situated and flexible enough to take advantage of a range of feedstocks from a variety of sources. Assuming average plant capacity of 30 million gallons per year, there would be a need for between 15 and 30 such plants, depending on geographic accessibility and the role played by municipal waste in the feedstock mix. Over time, we expect these plants to find uses for by-products from the waste generated by bioenergy products, and become production complexes for a range of end-products.

John M. Urbanchuk, an Advisory Panel member and Director of LECG LLC, led the Panel to estimate future job potential if bioenergy were to become established in the Bay watershed region. Using Bureau of Economic Analysis estimates, the Panel concluded that achieving the determined target of 500 million gallons of biofuels per year would create and support as many as 18,600 jobs in our region. Six thousand two hundred of these jobs would be associated with construction of the facilities, and 12,400 with production and associated indirect and induced effects.[5] Figure 3 (Page 7) summarizes the employment impacts for construction and annual production operations.

SETTING STATE-SPECIFIC PRODUCTION GOALS

A second work group of the Biofuels Advisory Panel developed a methodology for establishing state-specific biofuel production goals to support the regional target. This methodology recommends that jurisdictions construct their production goal as a vehicle to improve Chesapeake Bay water quality. This methodology, detailed in Appendix 3, includes four steps:

1. Inventory related programs and partners.
2. Gather data on current and projected land uses, crops, management practices and water quality goals.
3. Identify and catalogue planned biofuel production facilities, including location, technology, products, co-products, and anticipated feedstocks.
4. Estimate future biomass production and pollution loads by watershed.

The work group also recommended that, in addition to establishing biofuel production goals, jurisdictions should develop comprehensive implementation plans addressing infrastructure and market development needs. Jurisdictions should align their biofuel goals with relevant state and regional soil, water and air quality, transportation and economic development goals and identify and develop plans and policies to overcome market barriers that endanger biofuel and water quality goals. As part of its analysis, the work group also identified key sets of data required and their sources, relevant related programs and initiatives, and key partners and stakeholders. These are all listed in Appendix 3.

Ultimately, the combination of state-specific goals developed within the context of a regional target will guide policy development and creation of economic incentives that will nurture this emerging industry. The pursuit of these goals will require a strong partnership between the government of each state — both the Executive and Legislative branches — and the private sector. This partnership will ultimately become the defining feature of success.

Near-Term Policy Priorities

PRIORITY: DEVELOP BIOMASS HARVEST GUIDELINES

ISSUE: There is a lack of scientific evidence across the region concerning the amount of residual biomass that can be sustainably removed from fields and forests without negatively impacting soil quality, biodiversity and water quality.

RECOMMENDATION: State conservation and forestry agencies should work with their land grant institutions, federal partners and non-governmental organizations representing agricultural, forestry and conservation interests to develop state- and crop-specific guidelines for removal of crop and forest residues that are protective of both soil and water quality.

BACKGROUND: Crop and forest residues have been identified as important potential sources of biofuel feedstocks in the Chesapeake region. In particular, there is interest in using corn stover (the leaves and stalks) and the stems of wheat and other cereals left in the field following harvest of the grain. Likewise, there is a large amount of woody biomass in managed and harvested forests in the form of slash (branches and trimmings) and thinnings of smaller trees. A certain amount of slash and thinnings can be removed to provide environmental as well as economic benefits for landowners. These advantages include protection from disease, insects, storms, other natural disasters and wildfires. At the same time, removing too much residue can harm soil quality, soil stability, biodiversity, and water quality. Consequently, some efforts are underway to establish residue removal guidelines that balance the economic opportunity for landowners with the protection of soil and water quality.

The greatest progress is being made with forestry guidelines, led by the most active participant in our region — Pennsylvania. The Commonwealth has issued its forestry guidelines with the focus on residue removal for biofuel use. Maryland is in the early process of developing guidelines. Virginia does not have guidelines, but Virginia Tech has completed studies that provide information and recommendations related to practices within the state. Most experts recommend that forestry guidelines should be developed at the state level due to the varied forest composition among states.

A 2009 report by Evans and Perschel for the Forest Guild[6] reviewed existing residue removal guidelines world-wide and concluded that nearly all deal effectively with key issues of sustainable removal, but that there are some weaknesses in the areas of soil protection and site re-entry. As a general rule, there is insufficient feedback on how the guidelines are ultimately applied.

The Advisory Panel recognizes that state-specific guidelines would provide standards for the evaluation and promotion of sustainable industry practices as the bioenergy industry develops. Additionally, residue removal guidelines can help a state determine the potential amount of feedstock available from its forests on a sustainable basis, thus helping to determine a reasonable production goal.

Region-specific guidelines have not been established for agricultural residues, such as corn stover or straw. However, the USDA Natural Resources Conservation Service advises that all residue removal recommendations need to consider soil type, climate, cropping systems and management practices in order to protect soil quality while allowing for residue harvest for biofuel production. The USDA also points out that to be sustainable, residue must only be removed when soil quality will not suffer and that the sustainable use of crop residues can only be accomplished through the use of site specific harvest rates.

Because of the lack of scientific investigation into the issues surrounding the harvesting of crop residues in the Chesapeake region, the Advisory Panel could not develop recommendations for sustainable practices in our watershed at this time. As a result, the Advisory Panel recommends that agricultural crop residues should not be used as a bioenergy feedstock until management practices that protect soil and water quality are developed.

There is a particular need for research on the impact of residue harvest on soil carbon levels, greenhouse gas emissions and sequestration potential. As we begin to understand the interaction between soils, winter grain and cover crops and summer crop residue, we may find that certain levels of residue can be harvested as biomass.

Although caution is warranted with most crop residues, it is worth noting that technology is becoming available to allow corn cobs to be segregated from other residue during grain harvest. Cobs are a potential feedstock that could be removed from the field without impacting soil and water quality.

PRIORITY : USE WINTER CROPS AS FEEDSTOCKS

ISSUE: Winter annual crops are an under-utilized best management practice for water quality protection in the Chesapeake watershed, yet they offer significant promise as next-generation biofuel feedstocks.

RECOMMENDATION: Provide market-based incentives for the production of rye, barley, canola or other winter annuals as biofuel feedstocks.

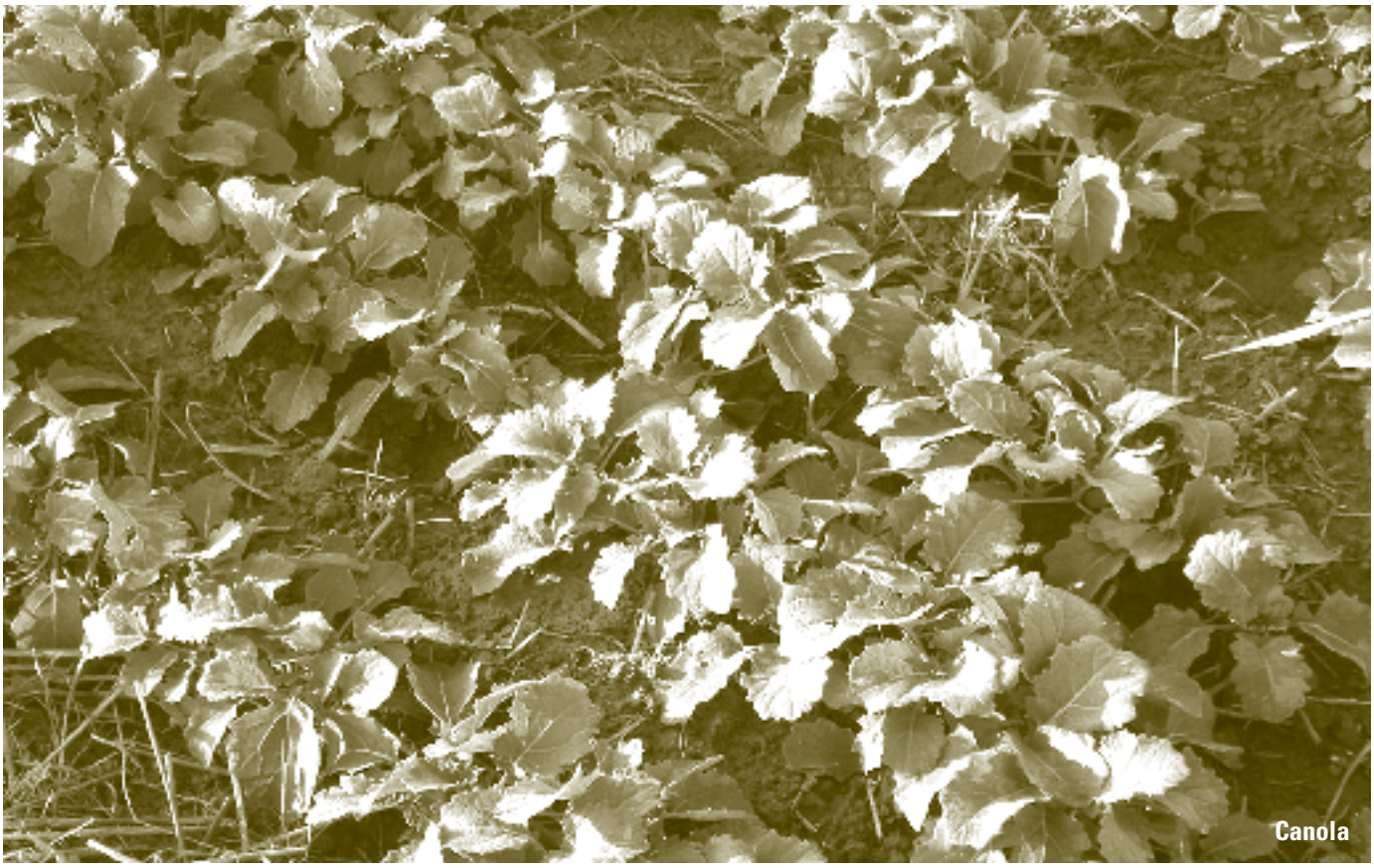
BACKGROUND: Winter crops of small grains, oil seeds or legumes have long been considered to have significant water quality benefits for the Chesapeake Bay and its rivers, primarily by absorbing excess nutrients in the soil. This is especially important when planted after a corn crop, as corn production can leave a significant amount of nitrogen residue in the soil. When planted without fertilizer and left unharvested, these winter crops are referred to as "cover crops." Their role in a farming system is simply as a tool for nutrient management and soil health. Cover crops are among the most cost-effective practices in terms of pounds of nitrogen and phosphorus removed per dollar spent, as was documented in a 2004 study by the Chesapeake Bay Commission.[7] Despite these advantages, cover crops remain an underutilized opportunity to improve water and soil quality, with farmer demand for state cost-share assistance far exceeding available resources.

Winter crops, planted with or without fertilizer and harvested in the spring or early summer, can provide environmental benefits as well. These benefits do not rise to the level of a pure cover crop, but they are an improvement over land that is left fallow in the winter.

Now, the demand for biofuels provides a new incentive to plant winter crops. Some cold-tolerant species such as barley and rye can be harvested in the spring as biofuels feedstocks for grain-based ethanol production. In the future, straw and silage from winter grains could be a cellulosic biofuel feedstock, and canola holds increasing promise for biodiesel. Winter crops are grown during a season when most fields would lie fallow, so they do not compete for land with major food or feed crops. Because winter crops are harvested in the spring, they would also help to provide a year-round supply of feedstocks to supplement those harvested in the summer or fall.

The balance between economic incentive and environmental protection raises a number of policy issues. States may wish to discourage the replacement of existing cover crop acres with harvested winter crops. States with cover crop incentive payment programs must determine whether they will pay for winter crops that are fertilized and harvested. Therefore, states may have to modify their current cover crop programs in order to allow the biomass to be used for energy production, or they could retain current cover crop programs and develop new programs to promote winter bioenergy crops on otherwise fallow land. In order to protect water quality for the public good, a tiered payment plan is one option to provide appropriate incentives for land use decisions.

Essentially, the roles of biofuel feedstock winter crops and traditional cover crops need to be part of an overall winter crop strategy that is consistent with state water quality and energy plans and goals. Additionally, there is a strong need for agronomic research to develop the science and practices that will optimize the benefits of these trade-offs and find synergies where they exist.


Canola

PRIORITY: AVOID INTRODUCTION OF INVASIVE SPECIES

ISSUE: In an effort to maximize biofuel production, new crop species may be introduced into the region that have the potential to become invasive at great cost to our ecosystem and our existing farms and forests.

RECOMMENDATION: The states in the region must work together to proactively identify species that can be safely introduced as well as those with the potential to become invasive. Policies must then promote native or identified safe species and prohibit the use of potentially invasive species as biofuel feedstocks.

BACKGROUND: Species favored as biofuel feedstocks typically have rapid growth, high biomass productivity, low fertilizer inputs and high tolerance to drought. They may also have the added appeal of requiring little to no herbicides or pesticides due to natural resistance to weeds, insects and diseases. These advantageous traits, however, can also be the characteristics of highly invasive species.

Some possible biofuel feedstocks (see Figure 5), such as switchgrass, are native to the Chesapeake region. While native species are normally not considered invasive, large-scale cultivation may indeed interact negatively with current cropping systems and the ecosystem at large. Other potential feedstocks include introduced sub-species, such as willow and poplar, which have a long history of co-existing with native tree species. Still others are not native to the region, and their compatibility with our ecosystem is unknown.

Newly introduced species, even seemingly benign crops, can become highly invasive when they are cultivated in a new environment. Prior examples of this occurring in the United States include kudzu and giant reed. Kudzu was introduced from Japan as a forage crop, promoted for soil enhancement as a legume and for erosion control because of its immense root structure and growth rate. Giant reed, native to India, was originally introduced for erosion control and as an ornamental perennial grass. Both species escaped cultivation and continue to thrive in their new environments. They are now dominant species found in regions of the Chesapeake watershed, suppressing native vegetation and causing costly environmental impacts.

As technology advances, interest in different biofuels feedstocks new to the Chesapeake region is expected to increase. Thus, the Chesapeake Bay Commission and the Chesapeake Executive Council have recommended that a regional protocol be developed to screen for and prevent the introduction of potentially invasive biofuel crops. It is important that such a protocol and screening process get underway immediately, before there are any major introductions of non-native species as biomass. It is also important to remember that it will take time to carry out the necessary scientific studies to determine the potential invasiveness of various species and to establish appropriate parameters and guidelines for each.

A pre-introduction screening protocol developed for Australia and New Zealand could be modified for use in regional systems within the United States including the Chesapeake region. The major components include a risk assessment using variables designed to determine a species levels of invasiveness, climate-matching modeling, potential for cross-hybridization, ecological analysis and experimental trials. Precautionary elements would include an emergency eradication plan and a requirement for producers to monitor their crops and scout field edges and adjacent habitats to discover any level of escape beyond cultivation.

Another concern arises from the threat of abandoned crops. Most crops grown for biofuel use are harvested before they reproduce. For a variety of economic reasons, a crop of potentially invasive plants may be left in the field and not harvested. If a non-native crop is allowed to go to seed, then chances for it to escape cultivation are greatly increased. Regional protocols should include measures to prevent such a scenario from occurring.

Pennsylvania's Department of Agriculture is developing a regional protocol for screening biofuel feedstocks through its Bureau of Plant Industry. Its first recommendation is to develop a "clean list" of acceptable known potential biofuel feedstocks that pose little threat of escape from cultivation. The list would take into account various agronomic parameters within the watershed and evaluate a potential species' ability to escape from cultivation, persist outside of minimally managed habitats, reproduce and spread to become invasive weeds. Such a list does not currently exist for the Bay watershed, but could be developed with regional participation.

Potential technical and informational resources for the evaluation include the Weed Science Society of America, Northeastern Weed Science Society, Council for Agricultural Science and Technology, and other university, government and non-profit research organizations that specialize in these areas. In developing a risk assessment for the Chesapeake region, information developed for the Australian Weed Risk Assessment and the University of California Davis Weed Risk Assessment could be helpful.

The Advisory Panel recommends that the following evaluations also be considered as part of a regional protocol:

- Potential of the feedstock to improve water quality and reduce soil erosion.
- Potential of the feedstock's ability to produce first generation ethanol or next-generation ethanol that is sustainable and profitable on non-cropland (reclaimed mine lands, idle lands, fallow pasture and other non-wooded areas not currently planted to feed or food crops).

These evaluations should be conducted as soon as possible, as research is currently underway on the use of several new species for use as biomass.

A Regional Council for Sustainable Bioenergy Development

Over the past three years, the Chesapeake Bay Commission and the Commonwealth of Pennsylvania have taken the lead in advancing analyses and recommendations related to the development of an economically vibrant and environmentally sound biofuels industry for the region. By convening the Biofuels Advisory Panel, we have been fortunate to draw upon some of the best minds in the country dealing with the complex scientific, technical and political issues surrounding biofuels development and its potential effects and benefits for water quality in the Chesapeake region.

The Advisory Panel now recommends that the primary responsibility for carrying forward the recommendations set out by the 2008 Biofuels Summit, endorsed by the Chesapeake Executive Council and augmented by this report, should shift to the executive agencies, supported by the state legislatures, along with cooperating federal entities. A number of implementation priorities require regional cooperation to ensure that a viable bioenergy industry will generate both economic development and environmental benefits for the watershed as a whole. To this end, the Advisory Panel recommends that the watershed jurisdictions establish a new regional authority.

A Regional Council for Bioenergy Development would oversee the broad range of options under consideration, and not limit itself to liquid biofuels alone. As noted in the Introduction to this report, the environmental and economic issues of concern arise from the production of agriculture and forest-based biomass, regardless of how that biomass is ultimately used.

The Advisory Panel recognizes that several regional entities already exist that could address some of the issues in the recommendations, such as the Chesapeake Bay Program, the Northeast and Southeast Regional Biomass Steering Committees, the Association of State Departments of Agriculture, and the Northeast and Mid-Atlantic Forest Utilization and Marketing Councils. However, the Advisory Panel also recognizes that an integrated focus on energy, agriculture, forestry, and water quality may not be adequately achieved by an organization that primarily focuses on only one of these issues. Still, staff support could be provided by any of these or other existing organizations.

The Regional Council for Bioenergy Development should be created through a Memorandum of Agreement (MOA) among the governors of the six watershed states (Delaware, Maryland, New York, Pennsylvania, Virginia and West Virginia), the mayor of the District of Columbia, the Chesapeake Bay Commission and the heads of appropriate federal agencies. A draft MOA is offered below.

The governors and federal government should appoint up to three members, who should primarily be state cabinet secretaries and federal agency assistant secretaries. The Chesapeake Bay Commission and the District of Columbia should each supply one member.

The Regional Council for Bioenergy Development should initially concentrate its efforts on carrying out the 20 state and regional recommendations for next-generation biofuel development that the Advisory Panel identified in the *Next-Generation Biofuels* report and that the Chesapeake Executive Council members endorsed. While progress on many of these has been made in the past year, the Council should place its near-term focus on development of biomass residuals harvest guidelines, promotion of winter grain crops as biofuel feedstocks and the development of a regional protocol to prevent introduction of invasive species. Future efforts should include the integration of environmentally-sustainable biofuel policy with other regional goals, such as jobs creation, agricultural sustainability, and enhancement of communities of all sizes. The Commonwealth of Pennsylvania will assist with the transition of this work in the coming year.

Draft Memorandum of Agreement to Establish a Chesapeake Regional Council for Bioenergy Development

WHEREAS, the National Renewable Fuel Standard established in the Energy Independence and Security Act of 2007 sets levels of production for advanced biofuels beginning in 2009 at 600 million gallons and increasing to 21 billion gallons per year by 2022; and

WHEREAS, the Governors of this Chesapeake Region, and the Legislatures under the leadership of the Chesapeake Bay Commission (the Commission), have agreed to lead the nation in the move to next-generation biofuels in a manner that protects and restores our national treasure, the Chesapeake Bay, and the streams and rivers of its watershed; and

WHEREAS, the Commission and the Commonwealth of Pennsylvania (the Commonwealth) have championed the production of studies and reports with recommendations on how best to carry forward this effort in support of the development of a new bioenergy industry to benefit our environment, our farmers, our forest owners and the general citizenry; and

WHEREAS, a regional Biofuels Advisory Panel (the Panel) has been formed of national experts to advise on the environmentally and economically sustainable development of this new industry, and has provided ten state and ten regional recommendations for our enlightenment and consideration; and

WHEREAS, in response to a request from the Chesapeake Executive Council, the Panel has developed a next-generation biofuels production target for the region of 500 million gallons per year from agricultural and forestry sources, and has called for state priorities to set standards for the removal of crop and forest residues as biofuel feedstocks, to encourage the use of winter crops for biofuels, and to assure advanced analysis of the potential for invasive feedstock species prior to their introduction and wide use; and

WHEREAS, the impacts of these biomass crops on the agricultural and forest industries, rural communities and the environment are similar regardless of whether the crop goes to biofuels, biopower, or heat, and the distribution of limited biomass resources among these end uses is likely to shift over time; and

WHEREAS, the Panel recommends, and the Commission and the Commonwealth endorse the need for a more permanent structure to oversee development and support for the bioenergy industry at the highest levels of state and federal governments;

NOW THEREFORE, WE, the Governors of the six states of the Chesapeake Watershed, the Mayor of the District of Columbia, the U.S. Cabinet Secretaries with the greatest interest in the sustainable

development of a viable and environmentally beneficial bioenergy industry, and the Chesapeake Bay Commission agree to form and support a CHESAPEAKE REGIONAL COUNCIL FOR BIOENERGY DEVELOPMENT.

The Council shall be comprised of up to three members each appointed by the six Governors and one each appointed by the Mayor, the U.S. Secretaries of Energy and Agriculture and the Administrator of the Environmental Protection Agency and the Commission. State appointees shall generally be from appropriate members of the Governor's Cabinet, and Federal appointees shall generally be at the Assistant Secretary level.

The purpose of the Council shall be to assure the continuation of coordinated policy making with respect to the developing bioenergy industry and its potential environmental effects. The focus shall be on ways to find beneficial results for local economies, energy independence and environmental improvement and to incorporate sound science into the development of public policy regarding bioenergy. The starting point shall be the 20 recommendations of the Biofuels Advisory Panel, offered in its second report, *Next-Generation Biofuels: Taking the Policy Lead for the Nation* and the subsequent priorities they have recommended for their implementation.

The Council shall be formed in time to meet during the second quarter of 2010 and shall have a life of five years, at the end of which time its work shall be evaluated and a decision made as to the need for its continuation.

AGREED TO THIS _____ DAY OF _____, 2010 BY:

FOR THE STATE OF DELAWARE: _____

FOR THE STATE OF MARYLAND: _____

FOR THE STATE OF NEW YORK: _____

FOR THE COMMONWEALTH OF PENNSYLVANIA: _____

FOR THE COMMONWEALTH OF VIRGINIA: _____

FOR THE STATE OF WEST VIRGINIA: _____

FOR THE DISTRICT OF COLUMBIA: _____

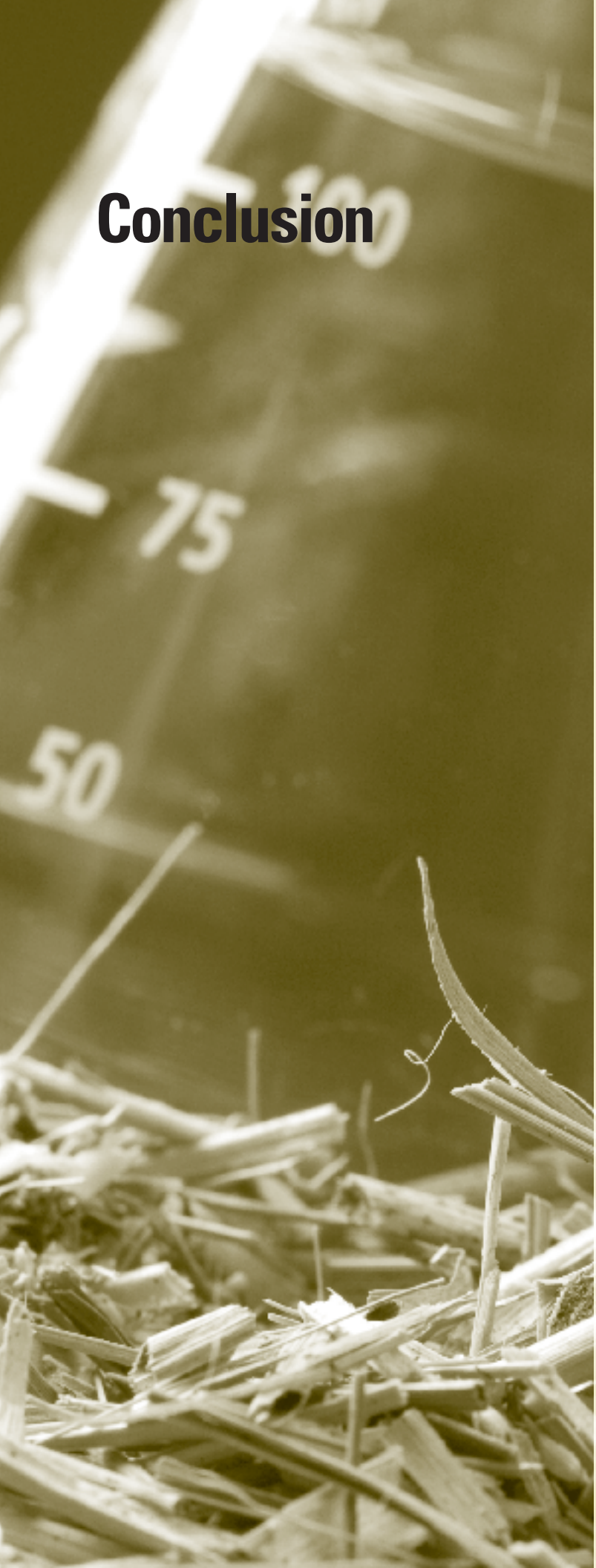
FOR THE CHESAPEAKE BAY COMMISSION: _____

FOR THE U.S. DEPARTMENT OF AGRICULTURE: _____

FOR THE U.S. DEPARTMENT OF ENERGY: _____

FOR THE U.S. ENVIRONMENTAL PROTECTION AGENCY: _____

Conclusion



Continuing analysis by the Chesapeake Bay Commission, Commonwealth of Pennsylvania, and the Biofuels Advisory Panel affirms initial conclusions that next-generation biofuels present tremendous potential for economic and environmental improvement, if developed in a thoughtful, sustainable and regionally collaborative manner. Promoting winter grain crops, establishing harvest guidelines, and developing a regional protocol to cope with potentially invasive species are near-term priorities for environmental protection, but states should also evaluate and promote the economic potential that could be realized through development of a state-specific production goal.

States should recognize that biomass production is likely to first be directed at local heating and power generating applications which will have their own impacts, before a full-scale biofuels industry develops in response to federal and state standards and goals. Regional estimates indicate a significant opportunity for the emerging bioenergy industry in various forms, and state-level analysis will maintain momentum in the agencies and legislatures where policies are created. Additionally, states can support and coordinate each other's efforts by forming a Regional Council on Bioenergy Development. Because it will support all of the other recommendations of this report, creation of this Council should be the region's first priority.

Appendix 1

Chesapeake Executive Council Directive 08-1

CHESAPEAKE EXECUTIVE COUNCIL

DIRECTIVE NO. 08-1

LEADING THE NATION IN DEVELOPMENT OF A SUSTAINABLE NEXT-GENERATION BIOFUELS INDUSTRY

As we approach 25 years of partnership to restore Chesapeake Bay, we recognize that our efforts to date have not been sufficient to achieve our water quality goals. At the 2007 Annual Meeting of the Chesapeake Executive Council, we reinforced our commitment to accelerate reductions of nutrient and sediment pollution from all sources across the watershed.

Our region's farmers have a long history of stewardship and conservation. However, their success is only a fraction of what must ultimately be done. Agriculture activity accounts for approximately 40 percent of the nutrient loads and 70 percent of the sediment loads to the Bay, and total agricultural loads must be reduced by 50 percent in order to meet the Bay's water quality goals. Fortunately, agriculture best management practices have been identified as some of the most cost-effective methods of reducing significant nutrient and sediment loads.

At the same time, segments of the agriculture industry are discovering unique opportunities from an emerging and quickly changing Biofuels industry. Ethanol production has provided new markets for corn, and as a result has impacted the markets and prices for a variety of agricultural crops, already influenced by fuel costs and world food demand. The potential for significant new corn acres in our region has the potential, if not managed properly, to partially offset the water quality gains we have achieved.

Our six-state region consumes 43 percent of the nation's home heating oil and 13 percent of its gasoline and we have a responsibility to help reduce our nation's dependence on foreign sources of energy. However, we must look for a sustainable means to do so. Cellulosic feedstocks for next-generation biofuels present a promising option. The trees and grasses that produce cellulosic biomass can absorb nitrogen and reduce sediment runoff to local waterways, and offer potential carbon sequestration and nutrient trading benefits.

A report jointly released this year by the Commonwealth of Pennsylvania and the Chesapeake Bay Commission, *Next-Generation Biofuels: Taking the Policy Lead for the Nation* ("Report"), concluded that our region's climate, soils and landscape, our close proximity to refineries and energy markets, and our thriving biotechnology industry and university research programs position us very well to lead the nation in the production and use of

these next generation biofuels. Informed by a 22-member select Biofuels Advisory Panel, the report identified ten state recommendations and ten regional recommendations which are summarized in the attached appendix. If implemented, these recommendations would support the region's goals to reduce nutrient and sediment loadings while strengthening the economic viability of agriculture and forestry in the watershed. To make next-generation biofuels a reality in the Bay region, we must act now.

THEREFORE, we hereby adopt the findings of the above-mentioned Report and commit to lead the nation in next-generation biofuels policy through the following actions:

- Implementation of Biofuel Action Plans which address the state and regional recommendations as presented in the Report;
- In 2009, the jurisdictions will develop a regional next-generation Biofuels production goal that includes a plan for market and facility development along with best management practices implementation necessary to support an environmentally sustainable biofuel feedstock;
- Reconvening of the Biofuels Advisory Panel during 2009 to achieve the following:
  - — During the first quarter of 2009, review the Biofuel Action Plans, solicit expert advice, coordinate with emerging federal policies, and determine our best strategies and timeline for regional action;
  - — During the third quarter of 2009, review the status of implementation and provide strategic advice on future action, including recommendations for the role the agriculture and forest sectors can play in sequestering and reducing greenhouse gas emissions.

Edward G. Rendell, *Governor of Pennsylvania*

Martin O'Malley, *Governor of Maryland*

Timothy M. Kaine, *Governor of Virginia*

Joseph Manchin III, *Governor of West Virginia*

Ruth Ann Minner, *Governor of Delaware*

Adrian M. Fenty, *Mayor of District of Columbia*

Arthur D. Hershey, *Chairman of the Chesapeake Bay Commission*

Appendix 2

Legislative Response to the Next-Generation Biofuels Report

A number of the recommendations in the *Next-Generation Biofuels* report require or are facilitated by legislative actions at the state level, and the general assemblies in all three Commission states – Virginia, Pennsylvania and Maryland – were active during their 2009 sessions. Following is a summary of legislation enacted and proposed, with a reference to the recommendation(s) of the *Next-Generation Biofuels* report to which the bill relates.

VIRGINIA

- **HB 2002/SB 1427** amends the Virginia Energy Plan to promote the sustainable production and use of advanced biofuels, to support the delivery infrastructure for the distribution of biofuels to consumers, and to increase the use of best management practices in forests and on farms to protect water quality (State Recommendations Nos. 1, 2 and 8).
- **HB 2001/SB 1186** amends the Biofuels Production Incentive Grant Program to provide a greater incentive payment (12.5 versus 10 cents per gallon) for advanced biofuels, and lowers eligibility from 2 to 1 million gallons per year (State Recommendations Nos. 2, 8 and 10).
- **HB 2165** allows farmers to engage in small-scale production of biofuels on acreage zoned agricultural without a special exception or special use permit (Regional Recommendation No. 4).
- **SB 1358** exempts from the alternative fuel tax any fuel produced by an agricultural owner or lessee which they apply to farm use or use in any motor vehicle they operate (Regional Recommendation No. 4).
- **SB 1357** expands the clean fuel vehicle job creation tax credit to jobs created for the production of advanced biofuels (State Recommendation No. 8).
- **SB 1146** passed the Senate but not the House; it would have required public bodies to procure diesel at 2 percent biodiesel or higher when the cost differential was no more than 5 percent, and would have increased the biodiesel blend based on available supply (State Recommendation No. 8).

MARYLAND

- **SB 555** passed the Senate but its companion bill, **HB 1379**, was not considered by the House Economic Matters Committee by the close of the 2009 legislative session. The bills would have amended the State net metering law to allow customers generating electricity from

cellulosic feedstocks to accrue credits for feedback to the grid (Regional Recommendation No. 4); required that at a certain biofuel production level within the state a specified percentage of the total volume sold state-wide would be cellulosic biofuels, modeled after current Pennsylvania law (Regional Recommendation No. 8); and allowed the Comptroller to void the content requirement under certain economic or market conditions.

PENNSYLVANIA

- **HB 110** would require the state diesel fleet to use 5 percent biodiesel by 2010 and 20 percent by 2016 (State Recommendation No. 8).
- **HB 136** proposes reclamation liability bonding to promote biofuel crops on surface mining reclamation lands (State Recommendation No. 6).
- **HB 1040** would permanently establish the Pennsylvania Fuels for Schools and Beyond Program within the Department of Agriculture, to promote the generation of heat and electricity from biomass at schools and other institutions (Regional Recommendation No. 5).
- **SB 698** would create a Pennsylvania Farms to Fuels initiative with per acre payments for transition to crops to produce cellulosic ethanol (State Recommendation No. 3).

Appendix 3

Methodology for Developing State-Specific Biofuel Production Goals

To facilitate the development of next-generation biofuels in the Chesapeake region, a state may find it useful to establish and incorporate production goals into its biofuel development action plans. The methodology described below is offered as guidance for developing these goals in a way that considers environmental sustainability, especially the protection and improvement of water quality.

1. Clearly affirm that the biofuel goal will be framed around desired water quality improvements.
2. Inventory existing federal, state and regional water quality goals.
3. Document baseline water quality data by watershed.
4. Estimate biomass production potential by type and resulting potential pollutant loadings by watershed.
5. Establish near-term, mid-term and 2022 goals for biomass production and best management practices that will support water quality goals.
6. Develop projections for biofuel production technologies and facilities that have a realistic chance for development (by watershed) factoring in relevant federal, state and local incentives.
7. Formulate draft goals.
8. Solicit public participation (as well as at other appropriate stages of development).
9. Develop infrastructure and market development plans and integrate with biofuel goals.
10. Align biofuel goal with other relevant state and regional goals for soil, water and air quality, transportation and economic development.
11. Identify and develop plans for overcoming market barriers.
12. Aggregate watershed goals into state and region goals.
13. Conduct a gap analysis to determine what resources, programs and expertise are required to accomplish goals.
14. Develop an action plan for ensuring successful attainment of biofuels and water quality goals.
15. Monitor progress towards achieving desired outcomes and make adjustments to accomplish same.

USEFUL DATA

- Land use data (current and *future* projections)
- Feedstock production (current and future types, including yield projections, input requirements and pollutant loading potential)
- Production technologies *with reasonable chance* for development
- Fuel and biofuel demand projections
- Water quality data (impaired/threatened)
- Conservation practices (available and installed)
- Current and projected number and distribution of flex fuel vehicles and pumps
- Available and projected infrastructure (size and location of existing biofuel/bioenergy production facilities, pipelines, blending facilities, biomass collection, transportation and storage equipment and facilities)

RELEVANT RELATED INITIATIVES AND PROGRAMS

- Federal Renewable Fuel Standard (RFS2*)
- State low carbon fuel standards*
- Clean Water Act (TMDLs*)
- Potential new Federal Cap and Trade legislation*
- Chesapeake Executive Council goals and milestones*
- Clean Air Act
- Federal Renewable Electricity Standard
- State Renewable Energy Portfolio Standards (for biopower)
- DOE/USDA grant, loan and loan guarantee programs
- Federal and state agriculture and forestry conservation and stewardship programs
- Other state goals

* denotes primary policy drivers

POTENTIAL PARTNERS

FEDERAL AGENCIES

- Environmental Protection Agency
- Department of Agriculture
- Department of Energy
- Department of Interior
- Federal Biomass Research & Development Board

NON-GOVERNMENTAL ORGANIZATIONS

- Agriculture
- Forestry
- Conservation
- Environmental
- Biofuel or Bioenergy

UNIVERSITIES

- Land Grant Colleges
- Forestry Schools
- Other Institutions

BIO-TECHNOLOGY INDUSTRY

CONVENTIONAL FUEL AND POWER PRODUCERS

FINANCE COMMUNITY

NATIONAL LABS

- National Renewable Energy Laboratory
- Oak Ridge Laboratory
- Idaho National Laboratory (National lab focused on feedstock supply chain)
- Argonne National Laboratory

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NOTES

1. A copy of the full report can be accessed at www.chesbay.state.va.us/Publications/BiofuelsAndTheBay1.pdf.

2. A copy of the full report can be accessed at www.chesbay.state.va.us/Publications/nexgen%20biofuels1.pdf.

3. R. L. Graham et al, Current and Potential U.S. Corn Stover Supplies, *Agron. J.* 2007 99: 1-11.

4. Guidance On Harvesting Woody Biomass For Energy In Pennsylvania, Pennsylvania Department of Conservation & Natural Resources, 2008.

5. John M. Urbanchuk, LECG LLC, 2009. Analysis based on the Bureau Economic Analysis, U.S. Department of Commerce, RIMS II employment multipliers for U.S. construction and other basic organic chemicals manufacturing industries using 1997 Input/Output Table and 2006 Regional data.

6. Evans, A.M. and R.T. Perschel, An Assessment of Biomass Harvesting Guidelines. The Forest Guild, 2009.

7. *Cost-Effective Strategies for the Bay: Six Smart Investments for Nutrient and Sediment Reduction,* Chesapeake Bay Commission, 2004, http://www.chesbay.state.va.us/Publications/cost%20effective.pdf.

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