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COMMENTS on
the REVISION of the LAND and RESOURCE MANAGEMENT PLAN
for the GEORGE WASHINGTON NATIONAL FOREST
on the issue of
WOODY BIOMASS PRODUCTION and SOURCING

Thank you for the opportunity to comment on the Land and Resource Management Plan for the George Washington National Forest (GWNF), which is currently being revised. Please accept these comments on behalf of Heartwood and Wild Virginia. These comments address issues related to potential woody biomass production and sourcing in the GWNF.

Biomass is a significant issue on the GWNF as forests are becoming a highly desired commodity in the world of energy generation. Power companies are burning more trees because the renewable fuel can be cheaper than coal and ignited without needing permits to release carbon dioxide, the primary greenhouse gas responsible for global warming.

There are significant environmental, economic and ecological problems with woody biomass, though. The U.S. Department of Energy has identified and discussed many of the problems and barriers to the use of biomass (see “ATTACHMENT” at the end of this document). Any thought of the GWNF providing source material for woody biomass is ill-advised. Sourcing for woody biomass on the GWNF is incompatible with other uses of the forest. Biomass production and sourcing should be prohibited in the GWNF and determined as so in the Forest Plan.

BIOMASS

Biomass refers to living and recently dead biological material that can be either converted into fuel or used as fuel directly for electricity production. Converting standing forests into fuel is potentially devastating to the forests of Virginia and should be set aside in favor of more positive solutions to energy problems. Given that many energy problems can be reduced or solved through conservation and increased efficiency, using the GWNF to increase energy supply could create incentives to use more energy. This would be contrary to, and exacerbate, efforts to conserve energy and increase efficiency.

There are basically two types of biofuel production which could potentially be considered as sourced from the GWNF: cellulosic ethanol and direct incineration. Both have potential to severely impact Virginia’s forested ecosystems.

CELLULOSIC ETHANOL

Cellulosic ethanol is made by chemically breaking down woody fiber and converting the byproduct into fuel. Because of the difficulties in separating lignin and other unconverted carbon compounds from cellulose and hemicellulose, which is then broken down into sugars and fermented, producing cellulosic ethanol from forests is grossly inefficient. It takes much more energy to create cellulosic ethanol than can be utilized from the fuel itself. This has not prevented businesses from seeking large government financial subsidies and guarantees as economic incentives to jump into an economically and energetically unsustainable process. According to a former EPA scientist, “because natural forests contain the highest amount of cellulose per acre and because the infrastructure and labor force needed for logging and chipping exists where significant harvests are already underway, regions already known for their forest products are likely to dominate in [cellulosic ethanol] feedstock provision.” (Laumer 2007)

Already, a significant amount of logging in the GWNF supports the pulp and paper industry. In addressing southern forests, Scot Quaranda (2009) writes “Imagine this already unsustainable level of forest management combined with large-scale consumption for use in the production of cellulosic ethanol. Clearcutting will increase well beyond current levels, threatening more of our endangered forests. Loggers would have strong financial incentives to remove any and all vegetative matter available including stumps. A greater level of conversion would [be likely to] occur, including the loss of natural forests to become fast growing tree plantations for use in production. More chemicals will be used and wildlife habitat will be lost at a much faster pace. Can we really afford to implement this ..?”

DIRECT INCINERATION

Burning forests to produce electricity threatens to destroy and further diminish many of America’s and the world's forests. Direct incineration biomass refers to living and recently dead biological material that can be used as fuel for electricity production. Congress is currently weighing the possibilities of sourcing plant material from natural forests for biomass electricity production. Businesses are currently looking at potential sights for biomass incinerators in the Commonwealth of Virginia.

All forms of biomass production are non-sustainable. They are ecologically destructive, they have a net energy loss, and there is not enough biomass in America to make significant amounts of energy because essential inputs like water, land, fossil fuels, and phosphate ores are limited.

Wood as a source of high quality fuel is a nonrenewable resource. Old-growth forests had very dense wood, with high energy content. The few pockets of old growth on the GWNF are rare and valuable for the habitat they provide. Secondary forests do not always come back with the vigor of the preceding forest due to soil erosion, soil nutrition depletion, and mycorrhizae destruction (Luoma 1999).

Wood as fuel from second, third and fourth growth forests is of lower quality with significantly lower energy content. Wood from fast-growing plantations is low-density and low calorie, making it undesirable even for use in domestic fireplaces. These plantations require energy to plant, fertilize, weed, thin, cut, and deliver. The trees are finally available for use after 20 to 90 years – too long for them to be considered a renewable fuel (Odum 1996).

There is not enough wood in the U.S. to fuel its civilization of 300 million people. Even though such a proposal is unrealistic and has not been advocated, the amount of wood required for energy production is enormous. Over half of North America was deforested by 1900, at a time when there were only 75 million people (Williams 2003). Most of the deforestation was from home use of the wood. In the 18th century the average Northeastern family used 10 to 20 cords per year. At least one acre of woods is required to sustainably harvest one cord of wood (Whitney 1994).

Protection and regeneration of forests, soils, fresh water, climate and biodiversity are urgent imperatives in the GWNF. Creating new incentives and demands for the removal of any natural plant material from the GWNF is misguided and will further degrade our values, our resources, and our ecosystems.

DEMAND FOR FOREST PRODUCTS

While the demand for wood products from the GWNF is relatively small, allowing biomass production on the GWNF would put increased demands on the forests to provide a supply of sourcing material for biomass incineration. These demands would occur at the expense, and to the detriment of recreation, wildlife, soils, water quality and primitive recreation. To ensure adequate supply, many incinerator companies require guarantees on the amount of biomass a community must send to an incinerator. Once the biomass incineration route is taken, communities are trapped burning up their valuable natural resources.

A single 50-megawatt biomass plant burns about 650,000 tons of trees a year, over a ton of wood a minute. Thirteen thousand (13,000) tons of biomass are required per megawatt of generation annually. (Massachusetts Department of Energy Resources 2007)

Because natural forests contain the highest amount of cellulose per hectare, and because the infrastructure and labor force needed for logging and chipping exists where significant harvests are already underway, regions already known for their forest products are likely to dominate (Quaranda 2009).

Biomass combustion competes with other industries that want this material for construction, mulch, compost, paper, and other profitable ventures, often driving the price of wood higher than a wood-burning biomass plant can afford.

BIOMASS AS INEFFICIENT ENERGY PRODUCTION

Wood is a less energy rich material than coal. More cellulose than coal must be burned to release a comparable amount of energy. In fact, biomass energy averages only 24% efficiency. Thus, 76% of the energy in wood is wasted while 100% of the wood burned generates pollution. (Massachusetts Environmental Energy Alliance 2009).

Processing materials with different physical properties is energy intensive, requiring sorting, handling, drying, and chopping. Combustion plants need to produce, transport, prepare, dry, burn, and control toxic emissions. Collection is energy intensive, requiring some combination of bunchers, skidders, whole-tree choppers, or tub grinders, all before hauling material to the biomass plant. There, the feedstock is chopped into similar sizes and placed on a conveyor belt to be fed to the plant.

It is hard to optimize the pyrolysis, gasification, and combustion processes if different combustible fuels are used. Efficiency is lowered if material with a high water content is burned, like fresh wood. Different physical and chemical characteristics in fuel can lead to control problems (Badger 2002). When wet fuel is burned, so much energy goes into vaporizing the water that very little energy emerges as heat, and drying takes time and energy.

AIR QUALITY

Burning biomass for energy emits large amounts of air pollution and endangers human health. Biomass incinerators produce hundreds of tons of nitrogen oxides and volatile organic compounds, two ingredients of the ground-level ozone dangerous to human respiratory health and the environment (Environmental Protection Agency, www.epa.gov/particles/).

Biomass burning also produces tons of fine particulate matter, a pollutant associated with asthma, heart disease and cancer for which no safe level is known. Biomass emits as much matter per KWH as coal, and more than either natural gas or fuel oil. Particulates are considered more responsible for global warming than carbon dioxide alone. This negatively impacts climate and is particularly harmful for humans, animals and all things that need to breathe.

Biomass burning emits 1.5 times as much carbon monoxide (considered a toxic air pollutant) and 1.5 times as much carbon dioxide (the most important and damaging of greenhouse gasses) as coal. (Massachusetts Environmental Energy Alliance 2009)

Yet, despite being as dirty as coal, biomass incineration is formally designated along with wind and solar sources as “clean energy” in the American Clean Energy and Security Act of 2009, HR 2454, now pending in Congress. Unfortunately, this legislation would make biomass incineration qualify for renewable energy credits.

Biomass conversion, like all incineration -- is a doomed technology. These processes generate hazardous emissions and toxic ash or residue, are very expensive, compete with recycling programs, and destroy valuable resources.

Combustion pollution is expensive to control. Some biomass has absorbed heavy metals and other pollutants from sources such as coal power plants, industry, and treated wood. Combustion can release chlorinated dioxins, benzofurans, polycyclic aromatic hydrocarbons, cadmium, mercury, arsenic, lead, nickel, and zinc. Combustion contributes to global warming by adding nitrogen oxides and the carbon stored in plants back into the atmosphere, as well as removing agriculturally essential nitrogen and phosphate (Reijnders 2006)

NEPA, LIFE CYCLE OF RESOURCES AND ENVIRONMENTAL IMPACTS

The planners and project managers on the GWNF have a responsibility to look at the entire life cycle of forests and their potential uses in planning and decision making. If the GWNF is to consider the use of our forest for biomass production, such consideration should include detailed analysis of these effects, as would be included in an Environmental Impact Statement. This analysis should include "cradle to grave" impacts at every step of the process. If the GWNF plan were to allow production of woody biomass, it would be responsible for all of these impacts and all of those noted here. All impacts need to be considered in detailed analysis.

Regarding the issue of burning dead trees as biofuel--the forest needs that biomass to regenerate in a healthy manner. When dead trees are removed, the carbon soaking potential and health of the next forest is reduced. The declining health of forests may be attributable not only to the number and interactions of ecological stresses they are under (which are compounded by global warming), but to the fact that one, two, three or more rounds of timber have been harvested, thereby making a less and less healthy ecosystem over time. It is not unlike a garden that is never fertilized, loses vitality and productivity, becomes susceptible to pests, and finally fails.

FORESTS AND CARBON

The use of biomass incineration is a far cry from being "carbon neutral." In addition to increasing greenhouse gasses, the carbon released takes decades to re-sequester, a fact recognized by the Intergovernmental Panel on Climate Change. Young trees that grow back after logging sequester just a fraction of the carbon that has been removed and even after 25 years after cutting, new growth on a site is less than half of what was removed (Hubbard Brook Experimental Forest, Long Term Ecological Research Network, www.hubbardbrook.org).

RENEWABILITY

Trees may be renewable, but forests are not. Whenever timber removal or vegetation clearing is practiced, the assumption is that a forest will grow up to replace the one cut. While an individual tree seedling may (or may not) have the potential to replace a removed tree, subsequent forests fail to replicate, match or approach the quality of the forests they are replacing. In addition, future health and productivity of ALL forests is unclear. Studies are showing that some forests are now failing to soak up carbon dioxide due to rampant tree death. Complex components of a forest ecosystem -- soil, fungi, microorganisms and decomposers – will likely not recover for many decades.

WATER
A large scale biomass plant requires close to a million gallons a day for cooling. Hundreds of thousands of gallons of this water are vaporized in the cooling process. Plant cooling needs and water usage are greatest in the summer when high temperatures often reduce river flows and stress native fish. In addition, impacts of water takings will likely worsen as climate change and droughts further stress our rivers and water resources.

Biomass operations contaminate local rivers and water supplies. Heavily contaminated 'boiler water" rinse water gets pumped back into rivers at unnaturally high temperatures. This and all cooling water is taken from nearby sources. To minimize transportation costs, biomass plants are located near their sourcing areas. Therefore, decisions regarding biomass sourcing from the GWNF would directly impact the very streams and water sources which find their headwaters in the GWNF.

Timber harvest, vegetation management or clearing and road building which would accompany any biomass sourcing will simultaneously compact and erode soils, increase sediment loss and loads in streams and significantly impair the water quality and temperature of streams in the GWNF.

SOILS
Soil science should be factored into decisions about biomass production. In forests as well as farms, erosion is occurring at ten to twenty times the rate that topsoil can be formed by natural processes (Pimentel 2006). Soil forms an integral part of the environment. All plants depend on it as a reserve of nutrients for healthy functioning, thus making soil essential for the production of food, crops, forests, maintaining biodiversity and for the landscape. Major nutrients contained in fertile soil include phosphorous, potassium, nitrogen, calcium, magnesium and sulfur. Dissolved, they are taken up through the roots of plants, incorporated into plant biomass and finally returned to the soil when plants die or shed.

Logging slash left to decompose on site is not wasted wood. It provides an excellent source of carbon and nutrients for forest soil, badly needed after the extraction of large quantities of biomass in the form of logs. Tree tops in particular are very rich in nutrients. If logging slash is used for green energy, it may give rise to the "vacuum cleaner" effect. Instead of going into a site and hauling out logs, timber operators would be encouraged to "vacuum up" and remove all woody material. Chipping trees for electric power generation is a low value waste of a resource that should be treated as precious. Forest land is far more valuable unused than it is if used for wood chips.

Bioenergy production from forests and forest residues can affect the naturally balanced nutrient cycles leading to degradation of soil fertility. Removing nutrients when trees are harvested (especially in the case of rapid-growing soft woods, with low BTU content) and complete removal of logging residues ultimately interrupts the natural process by which decomposing plant matter replenishes soil nutrients and effectively makes the soil less fertile. Adverse affects on the community of microorganisms responsible for nutrient cycling, as well as chemical and physical changes in the soil causing nutrients to be converted into compounds less usable to trees, also contribute to the decreased soil fertility.

In agricultural settings, “The most prudent course is to continue to recycle most crop residues back into the soil, where they are vital in keeping organic matter levels high enough to make the soil more open to air and water, more resistant to soil erosion, and more productive." (Sampson 1981).

SOIL AND CARBON

Soils contain twice the amount of carbon found in the atmosphere, and three times more carbon than is stored in all the Earth’s vegetation (Jones 2006). Given that climate change could increase soil loss by 33% to 274%, depending on the region (O'Neal et al. 2005), and the increased sedimentation and erosion of biomass sourcing areas, the ability of soils to sequester carbon would be significantly reduced and impaired by any biomass sourcing in the GWNF.

CONCLUSION

Given the economic and environmental costs, biomass production should not be considered for the George Washington National Forest. The GWNF Plan should specify all land off limits and inappropriate for biomass production.

Sincerely,

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ATTACHMENT

THE U.S. DEPARTMENT OF ENERGY'S "BARRIERS TO BIOFUELS REPORTS"

This is a partial summary of biofuel barriers, drawn from the U.S. Department of Energy (DOE). Sources are two DOE reports:

- Biomass Multi-Year Program Plan, February 2009 (www1.eere.energy.gov/biomass/pdfs/mypp_feb2009.pdf)
- The Technology Roadmap for Plant/Crop-Based Renewable Resources 2020, 2009 (www1.eere.energy.gov/biomass/pdfs/technology_roadmap.pdf)

Resource and Sustainability Barriers

1) Biomass feedstock will ultimately be limited by finite amounts of land and water.
2) Biomass production may not be sustainable because of impacts on soil compaction, erosion, carbon, and nutrition.
3) It is not clear that perennial energy crops are sustainable, since not enough is known about their water and fertilizer needs, harvesting impacts on the soil, etc.
4) Farmers are concerned about the long-term effects on soil, crop productivity, and the return on investment when collecting residues.
5) The effects of biomass feedstock production on water flows and water quality are unknown.
6) The risks of impact on biodiversity and public lands have not been assessed.

Economic Barriers

1) Biomass cannot compete economically with fossil fuels in transportation, chemicals, or electrical generation.
2) There are not any credible data on price, location, quality and quantity of biomass.
3) Genetically-modified energy crops worry investors because they may create risks to native populations of related species and affect the value of the grain.
4) Biomass is inherently more expensive than fossil fuel refineries because:

a) Biomass is of such low density that it cannot be transported over large distances economically. Yet analysis has shown that biorefineries need to be large to be economically attractive – it will be difficult to find enough biomass close to the refinery to be delivered economically.

b) Biomass feedstock amounts are unpredictable since unknown quantities will be lost to extreme weather, sold to non-biofuel businesses, rot or combust in storage, or by used by farmers to improve their soil.

c) Ethanol cannot be delivered in pipelines due to likely water contamination. Delivery by truck, barge, and rail is more expensive. Ethanol is a hazardous commodity which adds to its transportation cost and handling.

d) Biomass varies so widely in physical and chemical composition, size, shape, moisture levels, and density that it is difficult and expensive to supply, store, and process.

e) The capital and operating costs are high to bale, stack, palletize, and transport residues.

f) Biomass is more geographically dispersed, and in much more ecologically sensitive areas than fossil resources.

g) The synthesis gas produced has potentially higher levels of tars and particulates than fossil fuels.

h) Biomass plants cannot benefit from the same large-scale cost savings of oil refineries because biomass is too dispersed and of low density.

5) Consumers will not buy ethanol because it costs more than gasoline and contains 34% less energy per gallon. Consumer Reports wrote they got the lowest fuel mileage in recent years from ethanol due to its low energy content compared to gasoline, effectively making ethanol $3.99 per gallon. Worse yet, automakers are getting fuel-economy credits for every E85 burning vehicle they sell, which lowers the overall mileage of auto fleets, which increases the amount of oil used and lessens energy independence. (Consumer Reports)

Equipment and Storage Barriers

1) Current biomass harvesting and collection methods cannot handle the many millions of tons of biomass that need to be collected.

2) A means to store huge amounts of dry biomass has not been determined.

3) No one knows how to store and handle vast quantities of different kinds of wet biomass. You can lose it all since it is prone to spoiling, rotting, and spontaneous combustion.

Preprocessing Barriers

1) We do not know what the optimum properties of biomass to produce biofuels are, let alone have instruments to measure these unknown qualities.

2) Incoming biomass has impurities that have to be gotten out before grinding, compacting, and blending, or you may damage equipment and foul chemical and biological processes downstream.

3) Harvest season for crops can be so short that it will be difficult to find the time to harvest cellulosic biomass and pre-process and store a year of feedstock stably.

4) Cellulosic biomass needs to be pretreated so that it is easier for enzymes to break down. Biomass has evolved for hundreds of millions of years to avoid chemical and biological degradation. How to overcome this reluctance is not well enough understood yet to design efficient and cost-effective pre-treatments.

5) Pretreatment reactors are made of expensive materials to resist acid and alkalis at high temperatures for long periods of time. Cheaper reactors or low acid/alkali biomass is needed.

6) To create value added products, ways to biologically, chemically, and mechanically split components off (fractionate) need to be figured out.