North Dakota Chapter of the Wildlife Society
Alternative Energy Committee

Issue: <u>Biofuels and Bioenergy</u>

The rising cost of transportation fuel and other forms of energy have highlighted our nation's dependence on foreign oil and led to growing concern over the impact of this dependence on National security. In addition, fossil fuels have long been our nation's main source of energy and science has indicated that emissions from burning fossil fuels have accumulated in the atmosphere and are contributing significantly towards global warming. These emerging issues have prompted our nation to focus and promote the use of renewable sources of energy, including biofuels, in a concerted effort to address these important concerns.

In August 2005, President Bush signed the Energy Policy Act of 2005, which, for the first time, established a Renewable Fuels Standard (RFS) of 7.5 billion gallons of biofuels by 2012. However, the biofuels industry has nearly exceeded the RFS in just two years. In response, Congress raised the RFS to 36 billion gallons by 2022 in the Energy Independence and Security Act of 2007, signed by President Bush on December 19, 2007. Other goals for renewable fuels have also been set. For example, the Secretary of Energy, Samuel W. Bodman, established an equally aggressive goal, the 30X30 initiative, which seeks to displace 30% of our nation's 2004 transportation fuel consumption, or 60 billion gallons/yr., with biofuels by 2030.

Currently, 141 ethanol plants are in operation within 20 states and have the capacity to produce approximately 7.7 billion gallons/yr. (ACE 2008). Another 68 plants are under construction with an additional production capacity of 5.0 billion gallons/yr. In addition, according to the National Biodiesel Board, currently 165 biodiesel plants are in operation with the capacity to produce 1.85 billion gallons/yr. Another 84 biodiesel plants are under construction with an additional production capacity of 1.37 billion gallons/yr. As the biofuel industry continues to evolve, the production of ethanol and biodiesel from farm products will continue to receive overwhelming support from the agricultural sector, including members of Congress who reside in farm states. This new market for agriculture will place added pressure on our natural resources for years to come.

Biofuels and bioenergy are a very broad and somewhat confusing topic and production can occur through a number of different processes. In general, production of biofuels and bioenergy fit into one of three categories:

1. Starch-based ethanol – ethanol produced from corn grain.
2. Biomass Utilization – examples of suitable feedstocks include monocultures or mixtures of perennial grasses, agricultural waste (i.e., corn stover, wheat straw), wood chips, municipal waste, manure, etc.
    a. Cellulosic ethanol – Enzymes are used to break down cellulose and hemicellulose and release fermentable sugars. Remaining lignin is burned and used to provide power for the biorefinery.

b. Pyrolysis – Carbon-based biomass feedstocks are converted directly to liquids and other by-products (bio-oil, bio-char, liquid fuels and other bio-based products) through a hydrothermal liquefaction process.
c. Co-firing with coal – Biomass feedstocks are burned in place of coal to produce electricity and heat and to help the plant reduce its greenhouse gas emissions.
d. Gasification – Biomass feedstocks are heated in the absence of O_2 until combustion occurs and a synthetic gas ("syngas") is produced. Syngas is a cleaner burning substitute for natural gas and provides an alternative form of energy to provide power for ethanol plants, coal plants, etc.

3. Biodiesel – produced from many sources but most notably soybeans and canola.

Corn ethanol is the most widely recognized and discussed alternative fuel. Corn ethanol resonates among farmers, political leaders and, to some extent the public, because we are familiar with corn, we know how to grow, transport and market corn and its use fits the existing stereotype of renewable energy from basic agricultural production. Corn ethanol has and always will contribute to our nation's alternative fuel needs but production capacity is limited. The new RFS states that 15 billion gallons/yr. will come from corn ethanol by 2022. Corn ethanol competes directly with food production to some degree and some experts are concerned that the corn craze will lead to higher food prices for American consumers and greatly diminished exports for world food markets. In order to address this concern, some experts have suggested that the U. S. will need more than 10 million additional acres of corn in the short-term to supply the corn ethanol industry, maintain cheap food and maintain current export levels. However, the National Corn Growers Association (NCGA) (*www.ncga.com*) has indicated that more acres are not necessary and the increasing demand can be met through annual yield increases that are the result of biotechnology, improved cropping practices and better ethanol conversion efficiencies. Despite these claims, farmers planted nearly 93 million acres of corn in the U.S. in 2007, an increase of 13.5 million acres from 2006. This is the largest acreage in the U.S. since 1944. Corn acreage in North Dakota also rose to a new record of 2.5 million acres in 2007, an increase of 810,000 acres from 2006. As corn acreage and ethanol production continue to increase, it is likely that in the future ethanol production will compete directly with food production. Many renewable energy experts agree that, at best, corn ethanol can replace 25% of our nation's transportation fuels.

Most renewable energy experts agree that in order to meet the national goal of replacing 30% of our transportation fuels with biofuels, ethanol will need to be gleaned from the conversion of biomass such as perennial grasses, wood chips, corn stover, wheat straw, and other forms of plant biomass. The new RFS also recognizes this and establishes a goal of 21 billion gallons of "advanced biofuel" production by 2022. The most widely discussed feedstocks for cellulosic ethanol production are perennial grasses and switchgrass in particular. Perennial grasses offer several advantages over corn. Perennial grasses only need to be planted once, yet once established, will provide a biomass crop each year. Perennial grasses require fewer annual inputs which lead to fewer greenhouse gas emissions and higher energy efficiencies. Research shows that ethanol significantly reduces greenhouse gas emissions compared to gasoline, and cellulosic ethanol does a much better job than corn ethanol. Cellulosic ethanol provides a 60-110% decrease in greenhouse gas emissions compared to gasoline, whereas corn ethanol provides only

a 20-30% reduction (James and Werner 2002). Additionally, perennial grasses help address concerns over global warming in other ways by sequestering carbon from the atmosphere and retaining it in the soil and plant tissue for long periods of time. Perennial grasses are also better adapted to variable climates and therefore, produce a more reliable crop. Perennial grasses improve water quality in adjacent wetlands, lakes, rivers and streams as well. If properly managed, perennial grasses used for biomass can also provide valuable benefits for wildlife as long as the acreages used to grow perennial grasses replace existing cropland rather than previously unplowed native grasslands.

Although the value of perennial grasses as a feedstock for cellulosic ethanol production is clear, in order to reach commercial scale, much research is needed to address a myriad of questions surrounding the cellulosic ethanol industry. Which feedstocks are best? Where do monotypic stands fit in? Mixed-species stands? Where are the best places for them to be grown? What are the best management practices for establishment, harvest and storage? What type of transportation infrastructure is needed? How can production costs be lowered and conversion efficiencies improved to make cellulosic ethanol cost effective? Experts recognize the need to address these and many other questions in order to move the advanced biofuels industry forward and achieve the national goal. Recently, the U. S. Department of Energy (DOE) released a roadmap that helps chart a course of action (DOE 2006) that will begin to address many of these questions and concerns. The conservation community also has questions and concerns regarding the use of plant biomass for the production of cellulosic ethanol, energy and other bio-based products. The conservation community needs to work with the industry and begin addressing these questions and concerns to minimize the impacts of the advanced biofuel industry on our natural resources.

The North Dakota Chapter of The Wildlife Society (NDCTWS) fully supports the expanded use of renewable energy and we are optimistic that, if done correctly, biofuels production can occur in a sustainable manner with positive benefits for North Dakota's agriculture, environment and wildlife resources. Science, resource and market-based analyses of where and how biofuels production will be most economically viable and sensitive to environmental limitations, over any time frame but the very short term, are only beginning to emerge. Therefore, it is the view of the NDCTWS that it is premature to conclude that marginal lands, including those currently in native prairie grasslands or those enrolled in conservation programs, represent a viable land base for biofuels production. We believe that agricultural biofuels policy should not unravel the documented benefits of proven conservation programs like the Conservation Reserve Program (Reynolds et al. 2006; Nielson et al. 2006; Johnson 2000) and should avoid repeating past agricultural policy mistakes that provide relatively short-term economic benefits at the expense of significant, enduring, long-term environmental effects. It is clear that energy policy has and will continue to put added strains on our natural resources well into the future. The conservation community must recognize this and become deeply engaged in energy issues in order to identify opportunities for positive benefits to our natural resources and to minimize potential adverse impacts.

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This white paper was prepared by the Alternative Energy Committee of the North Dakota Chapter of The Wildlife Society. For more information on the topic discussed in the white paper or to provide comments, please contact Mike McEnroe at (701)224-8335 or memcenroe@btinet.net.