Science and Viewpoints Related to Perennial Biomass Crops in the Northern Great Plains

Ducks Unlimited, Inc. -- September 2006

As the country searches for ways to meet our national energy demands, attention has been focused on the potential of the Northern Great Plains (NGP) to produce energy from perennial plants like switchgrass. Shortly after scientists and policymakers began considering this opportunity, attention quickly shifted to using existing grasslands – native prairie and Conservation Reserve Program (CRP) lands – as the source of feedstock. An important part of this discussion must be the potential wildlife, conservation, and environmental impacts of such a policy. The purpose of this document is to highlight existing scientific information and offer viewpoints in an effort to better inform the debate and discussion about perennial biomass crops. Here, our comments emphasize cellulosic production of ethanol, since it appears that this is the technology which is closest to implementation on a commercial scale.

The Importance of Native Prairie

Decades of research reinforce the overwhelming importance of native prairie (often called pasture or rangeland) to the wildlife and environment of the NGP. This 10,000-year-old climax community has biotic and genetic diversity that is unrivaled by any other habitat type in the NGP, except perhaps prairie pothole wetlands. Native prairie is also a community that has been greatly impacted by cropland agriculture, and which continues to be lost at rates ranging from 0.5% - 2%/year. Endemic landbirds and migratory shorebirds are particularly dependent on native prairie for their habitat requirements. Many species will not nest in any other habitat. Perhaps for this reason, populations of grassland songbirds are declining at a faster rate than any other guild of birds. Even "the best" (i.e., the most unfragmented and floristically diverse) CRP does not compare to the habitat provided by native prairie. Once it's lost, most scientists agree that it is impossible to restore prairie to the full compliment of flora and fauna that existed in the native state.

As the opportunity for perennial energy crops unfolds, DU is very concerned that existing native prairie is not destroyed to produce energy crops. If future technology allows the use of diverse, native grass and forb species as feedstock for bioenergy production, care must be taken not to negatively impact the many values afforded by native prairie as this biomass is harvested. Moreover, caution must be used so that aggressive, perennial "biomass" plants do not invade and supplant native prairie, as has already happened in many places with Kentucky bluegrass and smooth brome infestations.

Maintaining the Values and Intent of CRP

The Conservation Reserve Program was established to benefit soil, water, and wildlife conservation. By any measure, those objectives have been met or exceeded in the NGP. Of particular significance (and surprise) to conservationists is the extent to which wildlife benefits have exceeded original expectations. For example, CRP in the Prairie Pothole Region is credited with adding an additional 2.1 million ducks/year to the fall flight, and entire "pheasant economies" have emerged as populations of the popular game species have exploded due to CRP habitat. Substantial wildlife benefits were expected but certainly not at the magnitude observed. Several studies have also documented the benefits of CRP to other grassland birds and mammals.

The most important aspect of CRP is the degree to which it increased the total amount of grassland habitat present at a landscape scale. Several studies have documented the importance of grassland dominated landscapes to high reproductive success for a diversity of bird species. CRP fields filled in gaps and provided complementary grassland nesting habitat to the existing base of native prairie and hayland. Changes in the landscape level of grassland are thought to have altered predator communities and thus reduced predation rates on ground-nesting birds.

Studies have also indicated that the idled nature of the cover (i.e., relatively high, dense grow with underlying residual vegetation), rather than the species composition of the CRP planting, has also provided unique benefits. This is reinforced by recent research comparing duck nesting density and success in CP-1 (tame grass mix) versus CP-2 (native grass mix) CRP planting, which revealed no significant differences among the cover practices. In contrast, undisturbed grassland appears to compliment existing cropland, grazed pastures, and hayed meadows. Undisturbed grass is, in effect, a rare habitat type that affords birds and other wildlife an attractive option for secure breeding and refuge.

Proponents of using existing CRP as a feedstock for biomass energy often overlook the value of idled cover and its attractiveness to grassland wildlife. CRP subjected to comprehensive, annual harvest <u>will not</u> retain the same wildlife values as idled CRP which receives partial, periodic harvest (i.e. management). Because 23% of the nations CRP is in the NGP (8.3 million acres across ND, SD and MT alone), even small, incremental reductions in wildlife benefits in

this region will have significant, continental impacts on some wildlife populations.
There are social and economic reasons for not using CRP as a platform for biomass energy feedstock. Since its inception, CRP has served as an emergency haying and grazing reserve during times of drought. In such times, the forage provided by CRP has been instrumental in helping the livestock industry weather tough times. This is the very industry that is the economic driver for retaining native pasture. Without a healthy livestock industry, land use will transition from pasture (native prairie) to cropland (a habitat with far fewer environmental and conservation benefits).

Acres enrolled in CRP also may not make a good starting point for launching a biomass energy industry simply because CRP is widely dispersed over the NGP, and proximity of feedstock to ethanol plants is such an overwhelming economic factor in the profitability of this industry. This topic of proximity and transportation costs is discussed further below. In addition, enzymes that are able to efficiently breakdown species mixtures of grass have yet to be developed, and most existing CRP acres are composed of such mixtures of two or more grasses and forbs. As mentioned earlier. droughts are a regular occurrence on the Northern Great Plains and available biomass in CRP fields is substantially reduced during these events. Therefore, most CRP would not be considered a reliable feedstock for the industry during many years.

If not CRP, then What?

Ducks Unlimited suggests a **CRP-like** program (i.e., an Energy Reserve Program) within the Farm Bill that is authorized, funded, and includes an acreage cap. Like CRP, the energy program could provide appropriate, annual payments to producers for growing biomass energy crops, particularly during the initial establishment period. It should also have criteria for enrollment, and that criteria should include a tight geographic focus around a location where a biomass energy plan will be – or is being – constructed.

The economics of biomass energy are dominated by three drivers: the conversion efficiency of the plant/technology, the per-acre biomass yield, and the transportation distance from farm to plant. To the latter point, it will do little good to have biomass energy acres widely dispersed over the landscape of the NGP. The area is too vast, and transportation costs too high. Instead, an energy reserve program should be designed so there is a synergy between industry and public policy that creates a positive dynamic between producers and local communities. For example, consider the merits of a program that qualifies producers for switchgrass commodity support if – and only if – they are located within a 50-mile radius of a new or proposed cellulosic ethanol plant. The local municipality will be motivated to retain/obtain the plant; growers will be assured that their crop is within a viable, economic transportation radius of the plant (hence they will have a market for their switchgrass crop); plant owners will be encouraged that there will be a ready supply of feedstock close by; and the government will not waste commodity support payments on fields that are widely dispersed and too far away from a plant to be of any use.

Switchgrass as a Commodity

As inferred above, it makes sense that switchgrass and other dedicated biomass energy crops should be considered commodity crops, not conservation program byproducts. This is important for several reasons. The first is to maintain clarity as to federal resources devoted to conservation versus commodity production. The U.S. taxpayer has shown a willingness to invest in both, but they (we) deserve clear accountability as to the magnitude of investment in each. Second, use of conservation programs to produce commodity products may set a dangerous precedent for other programs besides CRP. For example, if CRP can be used to grow energy crops, why shouldn't landowners be allowed to pump irrigation water out of wetlands enrolled in the Wetlands Reserve Program? Conceivably, the benefits of all USDA conservation programs could be undermined if we blur the distinction between conservation benefits and commodity production.

Third, producers who emerge to support the fledging biomass energy industry will likely need the same financial safety nets as those afforded other crop producers (subsidy, disaster, and insurance payments). Most of those payments originate from the Commodity Credit Corporation through an elaborate system administered by the Farm Services Agency. It just makes sense that support for perennial energy crops would be best accomplished by considering them a commodity from the outset.

Harvest Date and Stubble Height

With respect to switchgrass, it appears that a post-growing-season harvest will be the norm and that the switchgrass field will remain largely undisturbed during the spring through mid-summer nesting season. Under these circumstances, switchgrass can provide significant waterfowl and wildlife benefits provided that adequate stubble height is available for nesting birds the following spring. A minimum stubble height of 18 inches is recommended. Although we are not aware of empirical data to support the claim, in the arid NGP most crops do best when stubble height is sufficient to capture winter snowpack that provides for spring moisture. Thus, it may well be the case that the relatively small amount of biomass left unharvested to provide beneficial stubble height may be more than offset by improved moisture conditions and subsequent greater biomass yield the following year. Hence, maintaining robust stubble height may make economic sense in addition to benefiting wildlife.

The Interaction of Yield and Location

Because of relatively fixed input costs (relative to yield) to establish and maintain switchgrass and the implications of rapidly increasing transportation cost with increasing distance from field to factory, switchgrass yield (tons/acre) has emerged as a critical metric. At the farm scale, one implication is that energy farmers would do well to take advantage of high-yield varieties of switchgrass grown in a monoculture as a regular part of their farming and crop rotation. They might opt to grow switchgrass on fields with the poorest soil types on their farm, but nonetheless on soils that are more fertile and productive than their highly erodible lands now enrolled in CRP or being used as pasture.

On a larger scale, the best regions of the NGP to grow switchgrass may not be those landscapes that tend to have poor soils – landscapes now dominated by native prairie or with large enrollments in CRP (i.e., the Missouri Coteau in the Dakotas). Conversely, the landscapes with the deepest, richest soils in high rainfall regions (i.e., the Red River Valley in the Dakotas) may continue to be best suited to growing high value crops for food, and biomass crops may simply not compete economically. This suggests that the "sweet spot" for energy crops may be in areas with moderately good soils, moderate land values, and moderate moisture regimes (i.e., the Drift Plain region of the Dakotas). This notion seems to be born out by economic models developed by Oak Ridge National Laboratory and others. Establishment of perennial energy crops such as switchgrass is also likely to be more successful and lead to higher yields on current cropland rather than existing CRP lands that may be converted to monocultures of dedicated energy crops. Existing cropland has been subjected to regular herbicide treatments, substantially reducing the seedbank for most annual weeds and providing an environment that optimizes timely establishment of switchgrass seedlings.

Integrating Ecological Goods and Services

Switchgrass and other perennial energy crops have already been linked to an important ecological service: carbon sequestration. Indeed, the opportunity to combine aboveground energy production with belowground carbon sequestration is significant and worth pursuing, but there are many other ecological goods and services that have been overlooked. These include fish and wildlife habitat enhancement, water quality improvement, sedimentation and nutrient loading reduction, attenuation of flood events, groundwater recharge, biological diversity conservation, and increased opportunities for education, research, and recreation. In "the new economy", these services are acquiring a value as commodities, sometimes in the global market. As these become marketable commodities, the ecological goods and services associated with biomass energy crops might effectively "buy down" the cost of energy production by providing additional revenue from the land. If the combination of income streams is sufficient the break-even price for the biomass product may be lower, thereby improving the economic climate under which investors decide to locate an ethanol plant.

Conclusion

As the opportunities for switchgrass and other perennial biomass crops evolve, Ducks Unlimited looks forward to informing the discussion and encouraging industry in a way that provides new energy sources that are complimentary to wildlife and the environment.

For more information contact:

Scott McLeod at 701.355.3541 or smcleod@ducks.org
Jim Ringelman at 701.355.3511 or
jringelman@ducks.org