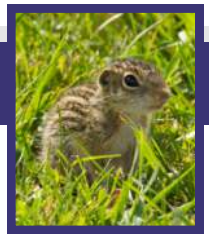

Effects of Bioenergy Production on Wildlife and Wildlife Habitat

A Technical Review published by The Wildlife Society

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The production of biobased feedstocks (i.e., plant– or algal-based material use for transportation fuels, heat, power and bioproducts) for energy consumption has been expanding rapidly in recent years. Biomass now accounts for 4.1% of total U.S. primary energy production. Unfortunately, there are considerable knowledge gaps relative to implications of this industry expansion for wildlife.

The Wildlife Society convened an expert committee to analyze the latest scientific literature on the effects of growing, managing, and harvesting feedstocks for bioenergy on wildlife and wildlife habitat, and provide answers to questions and variables affecting bioenergy development and wildlife so that site managers might better predict consequences of managing bioenergy feedstocks.

This Technical Review is organized with respect to an ecosystems approach and tries to identify key biomass management practices within those systems, including agricultural lands and croplands; grassland ecosystems and Conservation Reserve Program (CRP) grasslands; forest ecosystems; and algae and aquatic feedstocks. A PDF of this review can be downloaded for free at: wildlife.org/publications/technical-reviews. Key finding and recommendations of this review are provided below.

FINDINGS:

- The greatest consequences of bioenergy production on wildlife will likely stem from habitat alteration, either through the conversion of wildlife-rich landscapes to low diversity bioenergy farms, or by more intensive resource use from landscapes.
- Although mixed plantings (i.e., polycultures) complicate farming processes and are generally avoided, replacing biofuel monocultures with perennial, polyculture planting will likely benefit ecosystems because of the structural diversity they create (p. 9).
- In grassland ecosystems, crop selection and placement are important for determining arthropod diversity and biomass. Replanted native grass mixes were most effective, as arthropod diversity increased 230% and 324% in switchgrass and mixed-grass-forb prairie plantings (p.21).
- Wildlife response to forest biomass harvesting techniques varies among taxa and production systems. However, most taxa respond positively to thinning treatments, which can increase species diversity by creating a variety of habitat types (p. 35).

Prairie cordgrass (*Spartina pectinata)* at EcoSun Prairie Farms, South Dakota. (*Credit: Dr. Carter Johnson,, South Dakota State University)*

Grasshopper sparrow (*Ammodramus savannarum*) in restored native Texas prairie. (*Credit: Chuck Kowaleski)*

- Provided ecosystems with high conservation value are not replaced, short-rotation woody cropping (SRWC) systems could increase biodiversity in forested landscapes by providing shrubby habitat structure for non-forest species and increasing structural heterogeneity (p. 37).
- Because algae do not require soil for growth and can be grown in freshwater or saltwater, some of the land-use issues associated with other forms of biomass can be avoided. However, its implications for wildlife are still mostly unknown (p. 41).
- Implications of bioenergy production on wildlife will depend largely on where feedstocks are grown, what is planted, how biomass is managed and harvested, and landscape extent and context. Close management of environmental conditions and resources is necessary for the survival of wildlife (p. 43).

RECOMMENDATIONS:

- To evaluate the effects of feedstock production on wildlife populations, impacts on species' resources, spatial arrangement of those resources, and shifts in species interactions that may lead to changes in survival and viability must be considered.
- Companion plantings of wildlife-friendly grasses, legumes and other forbs and shrubs (if site appropriate) as field borders and alternating strips at least 15m wide between 100m wide monoculture plantings will greatly enhance vegetative diversity and use by wildlife (p. 9).
- Impacts on grassland ecosystems can be lessened by planting diverse native biomass mixes, managing unharvested material to provide cover, rotating harvests so that only a portion of each field is harvested annually, and incentivizing adherence to proper management practices and sustainability standards (p. 44).

East Texas little bluestem (*Schizachyrium scoparium*) cultivar trails. (*Credit: Chuck Kowaleski)*

Intercropping dedicated energy crops within planted pine stands may become a viable option for biofuel feedstock production. *(Credit: Sam Riffell, Mississippi State university, courtesy of Weyerhaeuser and Catchlight Energy, LLC.)*

- Resident and migratory grassland bird populations have sharply declined in the last 25 years. Habitat restoration is the key to conservation of grassland ecosystems, and mixed-native perennial grass/forb field plantings are preferred because they are best suited to local environmental conditions and provide the highest quality wildlife habitat.
- Extensive conversion of grasslands or native or intensively-managed forests to SRWC likely would decrease overall diversity, especially if SRWC replace high conservation value habitat types. Longer rotation and harvest schedules that provide a variety of canopy heights would maximize biodiversity value but may reduce economic viability of SRWC plantations (p. 38).
- Because micro-algae can easily aerosolize, escape, and spread, the use of invasive, exotic, and genetically modified algae and the potential impacts of aquatic feedstock farming on nearby ecosystems are cause for concern and should be investigated (p. 42).
- Future research will need to be prioritized based on current and pending legislation to have the greatest potential influence on policy that considers wildlife sustainability in the context of bioenergy development (p.43).

Demand for bioenergy will continue to increase as human populations expand and wildlife will continue to feel pressures of competing interests. This review aims to expose areas in need of additional attention and encourage stakeholders to continue pursuing knowledge for the sake of our wildlife resources.

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Northern bobwhite quail (*Colinus virginianus*). *(Credit: Ben Robinson, Kentucky Dept. of Fish and Wildlife Resources)*