Impacts of Bioenergy Crop Production on Environmentally Sensitive Lands
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Summary
This report provides a summary of key findings of Focus on Energy’s Environmental and Economic Research and Development program project #10-12/3104-01-10 (Principal Investigator Steve Ventura). It is organized by two long range objectives, each with several associated activities. Several documents are attached to this report, providing additional detail.

The overall goal of this research was to provide sound and defensible guidelines for production of biomass on marginal land. This goal was accomplished midway through the project by collaborating with personnel from the Wisconsin Department of Natural Resources (WDNR) and Wisconsin Department of Agriculture Trade & Consumer Protection (WDATCP) to create and publish Wisconsin Sustainable Planting and Harvest Guidelines for Nonforest Biomass.¹ Project-developed research informed the recommendations in this report, and project investigators and collaborators wrote substantial portions of the document.

The two main research objectives address nutrient requirements for bioenergy crop production and impacts of dedicated bioenergy cropping on wildlife habitat, one of several ecosystem services potentially affected by this kind of land use conversion.

The nutrient requirements objective included five activities:

- We created a database structure and data input templates for a data repository on switchgrass and short rotation woody crop (SRWC) nutrient response. This was validated and tested with data from the next activity;

- We gathered data from several previous switchgrass production trials of co-PI Matt Ruark and colleagues in Agronomy. We did not gather data from surrounding states, though the database design will accommodate this when and if it is appropriate;

- We added soil testing components in experiments conducted by UW researchers to more completely understand nutrient dynamics in switchgrass production;

- We attempted to establish a southern field trial site for willow production. In the first year of the project, the planting was not successful due to a late planting date and weather conducive to rotting of stems. In the second year, negotiations for land access broke down at the last minute and we were not able to secure other land. As an alternative, we were able to make arrangements to add additional monitoring and measurement to willow trials maintained by collaborator Jason Fischbach, UW Extension, Ashland County.

We developed initial guidelines for nutrient requirements for switchgrass, which will be included in the next release of *Nutrient Application Guidelines for Field, Vegetable, and Fruit Crops in Wisconsin* (UW Extension Bulletin A2809). Recommendations have been developed for hybrid willow production, but have not yet been sufficiently vetted for general release.

The habitat impact evaluation was oriented around the development and validation of a farm-scale habitat assessment tool.

- We validated the simple habitat classification schema as a starting point for farm-scale habitat impact evaluation through interaction with wildlife experts. We conducted an extensive literature review to determine what is applicable to Wisconsin from previously documented studies of habitat impacts from bioenergy cropping systems. These findings were further refined by developing detailed habitat requirements for five sensitive species that wildlife experts including project investigator Chris Ribic thought might be impacted by bioenergy cropping systems and three generalist species of interest for hunting and wildlife aesthetics reasons (deer, turkey, pheasant);

- We developed an interactive geographic information system (GIS) based tool for delineating habitat and conducting habitat change analysis. The GIS tool was programmed as additional functions in the open source GIS software QuantumGIS. We created a software link to another public domain package for landscape ecology metrics (habitat change evaluation) – FRAGSTATS, developed by the University of Massachusetts. These programs will be valuable for a wide range of habitat impact evaluations, and will be disseminated to other researchers and land managers.

- We have completed initial testing and validation of the GIS tool, but have not yet done extensive evaluation of habitat impacts. This will be done as part of a parallel project supported by the U.S. Department of Energy North Central Sun Grant program (Investigators: Ventura, Barham, and Jackson). As part of the latter, we are currently conducting interviews with farmers and non-farming rural landowners in southwest Wisconsin that have marginal land potentially useable for bioenergy crop production. Information from the interviews will allow us to capture considerable detail and nuance in scenario generation and evaluation of habitat impacts on these properties. Results will be provided to EERD as a supplement to this report at a later date.

- We have used the willow trials developed and maintained by collaborator Fischbach to conduct in-field monitoring of “real world” habitat impacts, specifically use of hybrid willow and mixed willow/poplar plantations by birds. In broad terms, there wasn’t a significant difference in species mixes between these systems or within cultivar mixes within systems. Bird abundance was higher in willow plantings compared to poplar stands, particularly where willow was inter-cropped. Deer browse was variable by variety but at this site was not so large as to significantly impair biomass production.